

SOILS AND FERTILIZERS

COMMONWEALTH BUREAU OF
SOIL SCIENCE



Vol. XI, No. 1

1948

PUBLISHED BY THE COMMONWEALTH BUREAU OF SOIL SCIENCE, HARPENDEN, ENG.

TABLE OF CONTENTS

	Page	FERTILIZERS— <i>continued</i>	Page
RECENT ADVANCES IN THE STUDY OF		PHOSPHATE 631.85	41
SOIL STRUCTURE... ..	I	ORGANIC FERTILIZERS 631.86/7	42
SUMMARY OF REPORTS	6	PLANT DISEASES AND PROTECTION ...	44
		EARTHWORMS 632.651.6 ...	46
AGRICULTURAL EQUIPMENT 631.3 ...	8	WIREWORMS 632.7	47
SOILS 631.4	8	INSECTICIDES, FUNGICIDES,	
SOIL CHEMISTRY 631.41	8	HERBICIDES 632.95... ..	47
REACTION 631.415	10	CEREALS 633.1	50
COMPOSITION 631.416/7 ...	11	GRASSES, LEGUMES 633.2/3 ...	52
TECHNIQUE AND ANALYSIS 631.42 ...	15	ROOT CROPS 633.4	54
SOIL PHYSICS 631.43... ..	21	POTATOES 633.491	55
SOIL TYPES 631.44	23	FIBRE PLANTS 633.5	56
SOIL EXHAUSTION AND EROSION		SUGAR AND STARCH CROPS 633.6 ...	58
631.458/9	25	TOBACCO 633.71	61
SOIL MICROBIOLOGY 631.46 ...	26	TEA 633.72	63
SURVEYS 631.47	30	HOPS 633.79	64
SOIL FORMATION 631.48	30	AROMATIC AND OIL PLANTS 633.8 ...	64
CULTURAL OPERATIONS 631.5 ...	30	GUAYULE 633.913.31	64
AGRICULTURAL SYSTEMS 631.58	32	ORCHARDS, FRUIT 634	65
RECLAMATION, DRAINAGE, IRRIGATION		FORESTRY 634.9	69
631.6	33	HORTICULTURE 635	69
FERTILIZERS 631.8	35	GEOGRAPHICAL	71
PLANT NUTRITION 631.811 ...	35	EUROPE (4)	71
TRACE ELEMENTS 631.811.9 ...	38	ASIA (5)	74
PLACEMENT 631.816.3	38	AFRICA (6)	76
LIME AMENDMENTS 631.821/2 ...	40	NORTH AMERICA (7)	78
POTASH 631.83	40	SOUTH AMERICA (8)	80
NITROGEN 631.84	41	AUSTRALASIA (9)	80

SOILS AND FERTILIZERS

COMMONWEALTH BUREAU OF
SOIL SCIENCE



Vol. XI, No. 2

1948

PUBLISHED BY THE COMMONWEALTH BUREAU OF SOIL SCIENCE, HARPENDEN, ENG.

TABLE OF CONTENTS

	Page	FERTILIZERS— <i>continued</i>	Page
RECENT STUDIES IN PHOSPHATE		LIME, AMENDMENTS 631.821/2...	117
FIXATION 	83	POTASH 631.83 	117
SUMMARY OF REPORTS 	86	NITROGEN 631.84 	118
		PHOSPHATE 631.85 	119
METEOROLOGY 551.5 	88	ORGANIC FERTILIZERS 631.86/7	120
AGRICULTURAL EQUIPMENT 631.3 ...	88	PLANT DISEASES AND PROTECTION 632	121
SOILS 631.4 	89	FUNGICIDES, HERBICIDES 632.95	123
SOIL CHEMISTRY 631.41 	89	CEREALS 633.1 	124
COMPOSITION 631.416 	90	GRASSES, LEGUMES 633.2/3 	128
ORGANIC MATTER 631.417 	93	POTATOES 633.491 	130
TECHNIQUE AND ANALYSIS 631.42	95	COTTON 633.51 	132
SOIL PHYSICS 631.43... 	99	SUGAR BEET 633.63... 	132
MOISTURE 631.432 	100	TOBACCO 633.71 	133
STRUCTURE 631.434 	101	MEDICINAL AND OIL CROPS 633.8 	134
SOIL TYPES 631.44 	104	RUBBER 633.912 	134
SOIL EROSION 631.459 	107	ORCHARDS, FRUIT 634 	135
SOIL MICROBIOLOGY 631.46 	108	FORESTRY 634.9 	138
SURVEYS 631.47 	112	HORTICULTURE 635 	139
SOIL FORMATION 631.48 	113	GEOGRAPHICAL 	141
CULTURAL OPERATIONS 631.5 	114	EUROPE (4) 	141
RECLAMATION, DRAINAGE, IRRIGATION		ASIA (5) 	144
631.6 	115	AFRICA (6) 	146
FERTILIZERS 631.81 	115	NORTH AMERICA (7) 	146
PLANT NUTRITION 631.811 	116	SOUTH AMERICA (8) 	148
APPLICATION 631.816.3... 	117	AUSTRALASIA (9) 	149

SOILS AND FERTILIZERS

COMMONWEALTH BUREAU OF
SOIL SCIENCE



Vol. XI, No. 3

1948

PUBLISHED BY THE COMMONWEALTH BUREAU OF SOIL SCIENCE, HARPENDEN, ENG.

TABLE OF CONTENTS

	Page	FERTILIZERS— <i>continued</i>	Page
ANHYDROUS AMMONIA AS FERTILIZER	151	PHOSPHATE 631.85	188
SUMMARY OF REPORTS	154	ORGANIC FERTILIZERS 631.86/7...	190
		PLANT DISEASES AND PROTECTION 632	191
METEOROLOGY 551.5	157	FUNGICIDES, INSECTICIDES, HERBICIDES 632.95	192
AGRICULTURAL EQUIPMENT 631.3 ...	157	CEREALS 633.1	194
SOILS 631.4	157	GRASSES, LEGUMES 633.2 3 ...	196
SOIL CHEMISTRY 631.41	157	ROOT CROPS 633.4	198
ORGANIC CHEMISTRY 631.417 ...	165	POTATOES 633.491	199
TECHNIQUE AND ANALYSIS 631.42 ...	165	FIBRE PLANTS 633.5	200
SOIL PHYSICS 631.43... ..	168	SUGAR CROPS 633.6	201
SOIL TYPES 631.44	171	TOBACCO, TEA, COFFEE 633.71/3 ...	203
SOIL EROSION 631.459	173	AROMATIC, MEDICINAL AND OIL PLANTS 633.8	205
SOIL MICROBIOLOGY 631.46	176	RUBBER PLANTS 633.9	205
SURVEYS 631.47	180	ORCHARDS, FRUIT 634	206
SOIL FORMATION 631.48	180	FORESTRY 634.9	209
CULTURAL OPERATIONS 631.5 ...	180	HORTICULTURE 635	210
AGRICULTURAL SYSTEMS 631.58	182	GEOGRAPHICAL	212
RECLAMATION, DRAINAGE, IRRIGATION 631.6	183	EUROPE (4)	212
FERTILIZERS 631.8	184	ASIA (5)	214
PLANT NUTRITION 631.811 ...	185	AFRICA (6)	216
PROPERTIES 631.812/3	186	NORTH AMERICA (7)	218
MINERAL AMENDMENTS, LIME 631.82	187	SOUTH AMERICA (8)	219
POTASH 631.83	187	AUSTRALASIA (9)	219
NITROGEN 631.84	188		

SOILS AND FERTILIZERS

COMMONWEALTH BUREAU OF
SOIL SCIENCE



Vol. XI, No. 4

1948

PUBLISHED BY THE COMMONWEALTH BUREAU OF SOIL SCIENCE, HARPENDEN, ENG.

TABLE OF CONTENTS

	Page	FERTILIZERS— <i>continued</i>	Page
THE C.A.B. CONFERENCE ON TROPICAL AND SUB-TROPICAL SOILS ...	221	PHOSPHATE 631.85	255
SUMMARY OF REPORTS	224	ORGANIC FERTILIZERS 631.86/7	256
A CATALOGUE OF INSECTICIDES AND FUNGICIDES	227	MIXED AND COMPOUND FERTILIZERS 631.89	259
		PLANT DISEASES. WEEDS AND PESTS. PLANT PROTECTION 632 ...	259
SOILS 631.4	228	FUNGICIDES, INSECTICIDES, HERBICIDES 632.95... ..	260
SOIL CHEMISTRY 631.41	228	CEREALS 633.1	262
COMPOSITION OF SOILS 631.416	231	GRASSES. LEGUMES 633.2/3 ...	265
ORGANIC MATTER 631.417 ...	234	ROOT CROPS 633.4	267
TECHNIQUE AND ANALYSIS 631.42 ...	235	POTATOES 633.491	267
SOIL PHYSICS 631.43	238	SWEET POTATOES 633.492 ...	270
SOIL TYPES 631.44	242	FIBRE PLANTS 633.5	270
TOXICITY IN SOILS 631.453	243	SUGAR CROPS 633.6	271
SOIL EXHAUSTION AND EROSION 631.458/9	243	STIMULANTS 633.7	273
SOIL MICROBIOLOGY 631.46	245	AROMATIC, MEDICINAL AND OIL PLANTS 633.8	274
SURVEYS 631.47	248	RUBBER PLANTS 633.91	274
SOIL FORMATION 631.48	248	ORCHARDS, FRUIT 634	275
CULTURAL OPERATIONS 631.5	248	FORESTRY 634.9	279
RECLAMATION, DRAINAGE, IRRIGATION 631.6	249	HORTICULTURE 635	280
FERTILIZERS 631.8	251	GEOGRAPHICAL	282
PLANT NUTRITION 631.811 ...	251	EUROPE (4)	282
PROPERTIES 631.812/3	253	ASIA (5)	284
PLACEMENT 631.816.3	253	AFRICA (6)	285
MINERAL AMENDMENTS, LIME 631.82	253	NORTH AND CENTRAL AMERICA (7)	286
NITROGEN 631.84	254		

SOILS AND FERTILIZERS

COMMONWEALTH BUREAU OF
SOIL SCIENCE



Vol. XI, No. 5

1948

PUBLISHED BY THE COMMONWEALTH BUREAU OF SOIL SCIENCE, HARPENDEN, ENG.

TABLE OF CONTENTS

	Page	FERTILIZERS— <i>continued</i>
LINSEED	287	PHOSPHATE 631.85
SUMMARY OF REPORTS	291	ORGANIC FERTILIZERS 631.86/7
AGRICULTURAL EQUIPMENT 631.3	293	PLANT DISEASES. WEEDS AND PESTS. PLANT PROTECTION 632
SOILS 631.4	293	INSECTICIDES, FUNGICIDES, HERBICIDES 632.95... ..
SOIL CHEMISTRY 631.41	294	CEREALS 633.1
COMPOSITION OF SOIL 631.416	296	GRASSES, LEGUMES 633.2/3
ORGANIC MATTER 631.417	299	ROOT CROPS 633.4
TECHNIQUE AND ANALYSIS 631.42	301	FIBRE PLANTS 633.5
SOIL PHYSICS 631.43	304	SUGAR CROPS 633.6
SOIL TYPES 631.44	306	STIMULANTS 633.7
FERTILITY, TOXICITY 631.452/3	308	AROMATIC AND OIL PLANTS 633.8
SOIL EROSION 631.459	309	ORCHARDS, FRUIT 634
SOIL MICROBIOLOGY 631.46	311	FORESTRY 634.9
SURVEYS 631.47	313	HORTICULTURE 635
SOIL FORMATION 631.48	314	GEOGRAPHICAL
CULTURAL OPERATIONS 631.5	315	EUROPE (4)
RECLAMATION 631.61	315	ASIA (5)
FERTILIZERS 631.8	317	AFRICA (6)
PLANT NUTRITION 631.811	317	NORTH AMERICA (7)
PROPERTIES 631.812/3	320	SOUTH AMERICA (8)
APPLICATION 631.816	320	OCEANIA (9)
MINERAL AMENDMENTS, LIME 631.82	321	
NITROGEN 631.84	322	

Page

SOILS AND FERTILIZERS

COMMONWEALTH BUREAU OF
SOIL SCIENCE



Vol. XI, No. 6

1948

PUBLISHED BY THE COMMONWEALTH BUREAU OF SOIL SCIENCE, HARPENDEN, ENG.

TABLE OF CONTENTS

	Page	FERTILIZERS— <i>continued</i>	Page
PARTIAL STERILIZATION	357	POTASSIUM 631.83	392
THE LIME REQUIREMENT OF SWEDISH SOILS	361	NITROGEN 631.84	392
SUMMARY OF REPORTS	362	PHOSPHATE 631.85	392
		ORGANIC FERTILIZERS 631.86/7...	394
AGRICULTURAL EQUIPMENT 631.3 ...	366	PLANT DISEASES AND PROTECTION 632	395
SOILS 631.4	367	WEEDS 632.5	396
SOIL CHEMISTRY 631.41	367	INSECT PESTS 632.7	397
COLLOIDS 631.414	368	INSECTICIDES, FUNGICIDES, HERBICIDES 632.95	398
REACTION 631.415	370	CEREALS 633.1	399
COMPOSITION 631.416	370	GRASSES, LEGUMES 633.2/3 ...	403
ORGANIC MATTER 631.417	373	POTATOES 633.491	404
TECHNIQUE AND ANALYSIS 631.42 ...	373	FIBRE PLANTS 633.5	405
SOIL PHYSICS 631.43	377	SUGAR CROPS 633.6	406
MOISTURE 631.432	377	STIMULANTS 633.7	408
STRUCTURE 631.434	378	AROMATIC AND OIL PLANTS 633.8 ...	408
TEXTURE 631.435	379	RUBBER PLANTS 633.9	409
SOIL TYPES 631.44	380	ORCHARDS, FRUIT 634	410
FERTILITY, TOXICITY 631.452/3 ...	382	CITRUS 634.3	411
SOIL EROSION 631.459	382	NUTS, PALM AND BUSH FRUITS, GRAPES 634.5/8	412
SOIL MICROBIOLOGY 631.46	384	FORESTRY 634.9	414
SURVEYS 631.47	387	VEGETABLES, HORTICULTURE 635 ...	414
SOIL FORMATION 631.48	387	GEOGRAPHICAL	416
CULTURAL OPERATIONS 631.5	387	EUROPE (4)	416
LAND RECLAMATION 631.61	388	ASIA (5)	418
IRRIGATION 631.67	389	AFRICA (6)	420
FERTILIZERS 631.8	390	NORTH AMERICA (7)	422
PLANT NUTRITION 631.811	390	OCEANIA (9)	424
MINERAL AMENDMENTS, LIME 631.821/2	391		

SOILS AND FERTILIZERS

Vol. XI

1948

No. 1

RECENT ADVANCES IN THE STUDY OF SOIL STRUCTURE

Interest in soil structure is increasing with growing recognition of the importance of structure in the maintenance of soil fertility and the prevention of erosion. The following is a review of some of the more important papers that have been published on the subject since 1940. The review is intended not to be a complete story, but merely a supplement to Technical Communication No. 37.

Measurement of soil structure. Russell and Tamhane⁽¹⁾ pointed out that the size distribution of soil crumbs (water-stable aggregates) is not an absolute property of soil, but depends on the experimental technique used in determining it. There is, however, no best method for determining size distribution, though if an appreciable proportion of the crumbs is larger than 0.5 mm. in diameter a wet-sieving method is practically essential. The results of a crumb analysis by wet sieving depend on the treatment a soil receives before analysis, and particularly on its moisture content and the method of wetting. The method of wetting affects water stability very markedly, the more rapidly the soil is wetted the lower the crumb stability, except when the soil is wetted *in vacuo* when crumb stability appears to be maximal.

Glotova⁽²⁾ showed that the results of wet-sieving analyses are entirely different when the soils are capillarily saturated before analysis from what they are without this treatment. Wide variations between analyses of the same soil are unavoidable, and the best that can be done is to repeat each analysis several times and take the mean. Kozlov⁽³⁾ found that capillary moistening increased the water stability of aggregates of chestnut soils and decreased that of aggregates from solonchets. He maintained that a preliminary capillary moistening is necessary if aggregate analysis is to give a correct picture of water stability.

Sekera and Brunner⁽⁴⁾, Smith and Browning⁽⁵⁾ and others explain the greater instability of crumbs to rapid wetting by the assumption that the destruction of a crumb takes place explosively as a result of the sudden compression of air by water entering the capillary pores. If the soil is slowly moistened the entrapped air has time to escape. This explosive destruction is most powerful when the soil is dry; it does not occur at all when the soil and water are brought into contact *in vacuo*. For this reason Sekera and Brunner recommend that structural stability should usually be measured on rapidly wetted soil samples whereby differences in stability are more clearly shown. These authors emphasize the difference between the static and dynamic methods of determining structure. Static methods aim at determining the size distribution of the crumb fragments produced by the action of water, dynamic methods at directly determining the effects of crumb destruction, e.g. reduced permeability or increased erodibility.

Andrianov⁽⁶⁾ proposed to eliminate the disintegrating effect of air compressed by the entry of water into soil crumbs by measuring the time taken for crumbs to disintegrate in still water after being moistened by capillary action for 3 minutes. This method also is claimed to show up differences scarcely apparent by other methods in structural stability.

McCalla⁽⁷⁾ measured structural stability by letting standardized drops of water fall onto a lump of soil on a 1-mm. sieve until it was sufficiently disintegrated to pass through the sieve. The stability was measured by the number of drops required.

Woodruff⁽⁸⁾ described a method in which soil crumbs are subjected to the abrading action of a nest of sieves oscillating up and

down in water that he claimed eliminated the common variables associated with aggregate analysis. The aggregation of the soil is characterized by an equation of the type $P=A/t^n$, where P is the state of aggregation after sieving for time t , and n is a measure of the susceptibility of the aggregates to destruction by sieving for time t .

Alderfer and Merkle⁽⁹⁾ calculated a "stability index" $S=\Sigma a-\Sigma m$ from curves showing on one diagram the aggregate and mechanical analyses of a soil: a being an aggregate-analysis percentage, and m a mechanical-analysis percentage on the "coarse" side of the interaction of the two curves.

Retzer and Russell⁽¹⁰⁾ point out that aggregate-analysis data expressed as a percentage of the total sample weight composed of aggregates above a certain size ignore the effects on structure of the distribution of aggregates below this size. They expressed their results in terms of a single figure called the coefficient of aggregation. The figure is proportional to the reciprocal of the total surface area per unit weight of soil. Browning, Russell and McHenry⁽¹¹⁾ obtained a positive curvilinear relation between the coefficient of aggregation and the percentage of aggregates larger than 0.10, 0.25 and 0.5 mm. They also found a linear relationship between the percentage of aggregates larger than 0.1 and 0.25 mm.

Structure and moisture. Vilensky⁽¹²⁾ has for several years studied the optimal conditions for cultivating the soil so as to produce the most stable crumb structure. He has shown that cultivation can create or destroy structure, depending on the moisture content of the soil, and consequently there is an optimal time for cultivation when the soil contains the "moisture of structure formation." In this condition, furthermore, the structure-forming effects of organic manures are greatest.

Vilensky also showed that by repeatedly dispersing and aggregating a soil (at the moisture of structure formation) the stability of the aggregates remained unchanged. Additions of peat at the moisture of structure formation did not increase structural stability,

whereas additions of liquid manure did. Addition of both peat and liquid manure had a very much greater effect than of liquid manure alone.

Puri and Rai⁽¹³⁾ also found that some soils could be dispersed and dried repeatedly without affecting the degree of aggregation in the dry state. They concluded that the water stability of soil crumbs was an inherent property of a soil dependent on its mechanical composition and therefore not liable to seasonal change.

Frantesson⁽¹⁴⁾, however, states that there is some destruction of stable aggregates by alternate wetting and drying, and that the amount of destruction depends on the speed of wetting and drying. The destruction is less the lower the speed, and Frantesson suggests that the effect of a mulch in the formation and preservation of soil structure may be related to this phenomenon. Boller and Stephenson⁽¹⁵⁾ found that aggregation under a 10-year straw mulch was much greater than under a 5-year mulch, and concluded that the aggregating effect of a mulch was gradual. Stauffer⁽¹⁶⁾ found that the surface layer, approximately $\frac{3}{8}$ inch thick, was less aggregated, even under a mulch, but particularly where there was no protective cover, than the underlying layer. The effects on aggregation of mulches of wheat straw, soybean straw and maize stalks were significantly different.

Martin and Craggs⁽¹⁷⁾ incubated soil and various forms of organic matter at temperatures ranging from 10° to 55°C., and moisture contents of 25, 50, 75 and 100 per cent. The effect on aggregation of varying the moisture content was small, though there was some indication of increased aggregation at 25 per cent moisture content. Temperature had a much more pronounced effect. The higher the temperature or organic-matter decomposition the more rapid the aggregation, but, at the same time, the less the degree of aggregation attained.

Biology of soil structure. The work of Gel'tser has already been described⁽¹⁸⁾ in which she advanced the hypothesis that the structure-forming fraction of humus was composed of the autolytic products of

bacteria. No other worker has yet substantiated this hypothesis, though many have attempted to elucidate the biological factor in structure formation. The data obtained have led to different conclusions.

Stöckli⁽¹⁹⁾ and others have shown that the greatest improvement in crumb structure is obtained when easily decomposable organic materials are added to soil, green manure being more effective than partly decomposed stable manure, which is more effective than peat. Stöckli found that crumb formation increased up to about 7 weeks after addition of manure, while aggregate stability reached a maximum after ten days and then decreased. Fungal mycelia were important binding agents.

Myers and McCalla⁽²⁰⁾ made bacterial counts and aggregate analyses of soils treated with calcium nitrate, sucrose, peptone and mixtures of sucrose and calcium nitrate. No simple relationship was found to exist between bacterial numbers and state of aggregation, but there was a complex relationship. Thus, changes in degree of aggregation tended to lag behind changes in bacterial numbers, suggesting that the products of microbial activity rather than the bacteria themselves were the main factor involved in aggregation. Again, additions of water increased bacterial numbers, but decreased aggregation. Calcium did not increase the stability of aggregates. Peele⁽²¹⁾ found that addition of sucrose promoted the formation of large, water-stable aggregates, and attributed the effect to the stimulated production of microbial mucus. Martin and Waksman⁽²²⁾ found that the binding effect on soil particles produced by pure and mixed cultures of micro-organisms was caused partly by the mechanical binding of fungal mycelia and partly by synthesised organic compounds. When sugar was used as the source of energy for the micro-organisms a greater binding effect was obtained than when cellulose was used, and in general the more readily decomposable the organic substrate the greater the aggregating effect. Martin⁽²³⁾ inoculated sterilized soils with pure cultures of various organisms,

and made aggregate analyses after three weeks' incubation at 25°C. A species of *Bacillus subtilis* produced the greatest aggregation (67 per cent), followed by the fungus *Cladosporium* (66 per cent). These two organisms were then grown in liquid culture to determine whether the aggregating substances could be produced outside the soil. The liquid culture of *B. subtilis*, when added to soil, brought about even greater aggregation than the organism itself, but the culture of *Cladosporium* had a much smaller effect. Treatment of soil with liquid culture of *B. subtilis* freed from cells, and with cells alone, showed that the former was much the more effective aggregating agent—i.e. the most active agent was a substance synthesised by the cells. It was concluded that about half of the aggregating influence of *Cladosporium* was due to the binding effect of the fungus mycelia on the soil particles. The use of different sources of nitrogen and carbohydrate for growing the bacillus had little effect on the production of aggregating substance, except that sucrose was more efficient than other sugars.

From the centrifuged and dialysed culture media a crude substance was obtained, containing 42 per cent of carbon and reducing Fehling's solution after hydrolysis. This substance appeared to be a hemicellulose-like substance which was attacked to a limited extent by fungi, and was readily destroyed by bacteria and actinomycetes.

In analogous experiments with calcareous soils Hubbell and Chapman⁽²⁴⁾ found that aggregation never occurred except in the presence of living microbes. This confutes Martin's conclusion that the main effect of micro-organisms on aggregation is attributable to cell secretions. Tests were made with bacteria, actinomycetes, fungi and the roots of Sudan grass. Each group of micro-organisms was capable of forming aggregates, but aggregation was less in cultures of bacteria than of fungi or actinomycetes. Sudan-grass roots did not produce any soil structure in sterile cultures. Two kinds of water-stable structures were present in the soil: microbial structures comprising soil particles held together by micro-organisms and root structures, and compound aggregates comprising microbial aggregates and

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entrapped soil particles held together by roots. The first are referred to as aggregates and the second as root structures. Stable soil structure in the field samples was always associated with a good growth of roots and micro-organisms. Roots contributed to structure formation only after this had been initiated by microbes, which were found in every root structure examined. Only after aggregates had been formed by microbes could roots synthesise larger structures by binding them together.

In a later paper⁽²⁵⁾ Martin identified the polysaccharides synthesised by and prepared from pure cultures of certain bacteria as fructosan and dextran containing a trace to 14 per cent of uronic acids. These polysaccharides were better aggregating substances than casein or alkali-lignin, with which they were compared. The most efficient aggregating agent was a dextran synthesised by an unidentified soil bacterium. The dextran contained by far the highest content of nitrogen (1.52 per cent) and of uronic acids (14.4 per cent) of any of the preparations used. The polysaccharides were fairly resistant to microbial decomposition, possibly owing to their uronic-acid content, though there were always some organisms capable of utilizing them.

Dawson⁽²⁶⁾ found no relation between numbers of micro-organisms (bacteria and actinomycetes) and state of aggregation of soils which had received 1-2 tons per acre of plant residues.

Nikolsky⁽²⁷⁾ advanced the hypothesis that the main factors determining the formation and stability of aggregates in chernozems are the roots of living plants and the undecomposed residues of dead plants. The root hairs serve to bind mechanical elements together, and the humus produced by the enhanced biological activity of the rhizosphere cements the more finely divided particles—the first stage of aggregate formation. The next stage is the formation of a water-stable mass under the influence of humus and adsorbed calcium and its simultaneous breakdown into granules by the action of root pressure, temperature changes, etc. When cultivated the aggregates remain stable only as long as undecomposed plant

residues are present to bind the mechanical elements together and the humus is saturated with calcium. The much looser structure of sod-podzol soils is attributed to a lower content of humus and to an unexplained precipitation of silicic acid in the root channels that disintegrates the structural aggregates.

Sekera and Brunner⁽⁴⁾ maintain that the microscope shows that whereas the smaller aggregates are composed of particles bound by colloidal cements, the larger aggregates are held together by living matter—root hairs, fungal mycelia, etc. Actual structural stability is the sum effect of these colloid-chemical and biological factors. A deficiency in the biological factor leads to a structural breakdown into small aggregates, and a deficiency in the colloid-chemical factor leads to a more or less complete peptization.

Alderfer and Merkle⁽²⁸⁾ refer structural stability to "organic" and "biologic" influences. Granules in poorly drained profiles are formed mainly by disintegration of more massive structural units and are stabilized by organic matter whereas granules in well drained profiles are formed by reaggregation of clay and organic matter. It is maintained that reaggregation is aided by the biological effects of added organic matter.

The effect of earthworms on structure. Gurianova⁽²⁹⁾ found that addition of earthworms to pots containing a chernozem soil and straw, stable manure or poultry manure resulted after about 5 months in very marked increases in the state of aggregation. The increase was most marked with straw, least with poultry manure. Soils of which the structure had deteriorated as a result of continuous wheat also benefited by the introduction of worms, but the benefits were much more marked in good soils growing lucerne. Seliakov⁽³⁰⁾ described a structural chernozem in the Altai foothills that had much more favourable physical and chemical properties than an adjoining structureless soil, the difference being accounted for by the activities of earthworms in the former. Hopp⁽³¹⁾ added earthworms to one of two containers containing sieved soil and found that after 3 days the wormed soil contained

twice as many aggregates (12%) that would not pass through the sieve as the no-worm soil. The water stability of the aggregates in the wormed soil was twice that in the control. Of several species of worms *Lumbricus terrestris* was most active, and produced about its own weight of aggregates in a day.

The effect of cropping on structure. Many workers have shown that a grass crop and, to a lesser extent, a close-growing legume crop have a marked effect in increasing the aggregation of the soil. On the other hand, structure tends to deteriorate under row crops as a result of intensive cultivation⁽³²⁾. By incorporating organic matter it is possible at least partially to maintain the original structural state, though liming brings about little or no structural improvement unless performed in conjunction with a rotation which adds organic matter to the soil. In pot experiments Browning and Milam⁽³³⁾ found a linear relationship between the state of aggregation and the dose of organic matter

applied, sucrose being more effective than crop residues. Peterson⁽³⁴⁾ found that sucrose, incubated for 30 days with a Tama silt loam, produced a peculiar, singular silty structure that could only be wetted with difficulty. Ground lucerne and ground maize stalks depressed aggregation. Weldon and Hide⁽³⁵⁾ found more C and N in well aggregated than in poorly aggregated fractions of eight Kansas soils.

Martin⁽³⁶⁾ has shown that neither organic manuring nor liming improves soil structure or crop yields in Uganda except in conjunction with a grass rotation, when quite small dressings of either organic or inorganic fertilizers produce appreciable increases, presumably as a result of improved soil structure. The best structure-forming grass was elephant grass (*Pennisetum purpureum*). Joachim and Kandiah⁽³⁷⁾ obtained increases in organic-matter content and a marked improvement of structure of Ceylon soils as a result of a three-year fallow of Napier grass.

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SUMMARY OF REPORTS

Reports received include: *Amani*, Report of the East African Agricultural Research Institute 1946; *Barbados*, Report of the Department of Science and Agriculture 1945-46; *Basutoland*, Report of the Department of Agriculture for the year ended Sept. 1946; *British West Indies Sugar Association*, Reports on Research work 1946; *Ceylon*, Report of the Department of Agriculture 1945; *Cheshunt*, Report of the Experimental and Research Station 1946; *Hannah Dairy Research Institute*, Annual Reports for the four years ending March 1947; *Hawaii Sugar Planters' Association*, Report for the year ending Sept. 1946; *Indore*, Report of the Institute of Plant Industry for the year ending May 1946; *Mauritius*, Report of the Sugarcane Research Station 1946; *Nyasaland*, Report of the Director of Agriculture 1945; *Palestine*, Report of the Department of Agriculture and Fisheries for the year ended March 1946; *United States Agricultural Experiment Stations*. *Alaska*, 1944-45; *Colorado*, 1945-46; *Florida*, for the year ending June 1946; *Hawaii*, Biennial Report 1944-46; *Kentucky*, 1946; *Michigan*, 1945-46; *Nebraska*, 1947; *Purdue University*, for the year ended June 1946.

Amani.—A soil map of Tanganyika Territory was prepared for a new edition of the "Atlas of Tanganyika Territory." It is a simplified edition on a scale of 1:4 M of the Tanganyika section of Milne's "Provisional Soil Map of East Africa." In the notes accompanying the map, a diagrammatic explanation of the catena is given.

Results of field trials with Uganda silicophosphate are being analysed at Amani. The silicophosphate is prepared from Uganda rock phosphate by calcining it with soda from Lake Magadi in Kenya. Field trial results from Kenya, Uganda and Tanganyika will be collated by Amani.

Barbados.—NPK manurial trials on sweet potatoes, maize and sugar cane. Prevention of soil erosion on arable land.

Basutoland.—Manurial trials on maize, wheat, kaffir corn and potatoes.

B.W.I. Sugar Association.—Nitrogen fertilizers, size of dressing, time of application and effects on crop quality. Comparison of $(\text{NH}_4)_2\text{SO}_4$ and NH_4NO_3 , NaNO_3 and cyanamide. Molasses as fertilizers.

Ceylon.—Soil reconnaissance surveys. Relationship between Si/Al ratio of clay fractions and ultimate pH and base exchange capacity of Ceylon soils. Ferrous iron content of soils. Manurial values of agricultural wastes. Manurial and cultural trials with paddy. Manurial and rotation experiments with tobacco.

Cheshunt.—The effects of sulphur on the reaction and lime content of a tomato soil. Effects of soil moisture and manurial treatments on *Verticillium* wilt. Trace-element deficiencies.

Hannah Dairy Research Institute.—Yield and manurial treatment of beans. High B content in fertilizer led to "yellowing" of seedlings.

Hawaii Sugar Planters' Association.—Effect of N on cane tops, fibre percentage in ratoon crop, total sugars and cane quality. Weeds. Effect of flame cultivation. Control of weeds by chemical sprays, sodium arsenite, diesel oil and 2,4-D.

Soil biology. Antibiotic substances versus beneficial soil bacteria. Soil organisms in plantation soils. Determination of microbial activity of soils in relation to fertility by measuring the amount of CO_2 evolved by the soil organisms. Effects of soil fumigation with D-D on the growth of three cane varieties.

Indore Institute of Plant Industry.—Improvement of alkali soils. Ridge cultivation of cotton. Manuring. Trials with groundnut cake and $(\text{NH}_4)_2\text{SO}_4$ on cotton. Influence of manuring and crop rotation on soil properties. Green manuring with sann.

Mauritius.—Manurial trials and foliar-diagnostic methods with sugar cane. Composition of molasses.

Nyasaland.—*Fertilizers.* Cultural and manurial experiments with *Aleurites*. Time of application of fertilizer to tea; spacing and cultivation. Manurial and cultivation experiments on flat and ridged land. Organic-manurial experiment on mixed crop of sorghum and millet as indicator crop. Cultivation, harvesting and mulching experiments on maize.

Palestine.—*Alkaline soils.* Effect of K on lime-induced chlorosis. *Irrigation* of citrus. *Weed control* with 2,4-D.

United States Experiment Stations

Alaska.—*Soil fertility test and green manure crops* with barley. The soil is deficient in N and P. A legume crop has been introduced into the rotation. *Potato fertilizer studies* with rates and ratios of N, P and K. *Crop rotation:* determination of the level of fertility that could be maintained in a crop-rotation system without applying manure or fertilizer. *Pasture improvement:* grazing studies and fertilizer studies with NPK.

Florida.—*Fertilizers.* Effect on yield, grazing value, chemical composition and botanical make-up of pastures. Flue-cured tobacco fertilizers. Nutrition of peanuts. Relation of Zn and Mg to growth and reproduction in pecans. Effects of B on certain deciduous fruits and nuts. Soil and fertilizer studies with celery. Citrus nutrition studies. *Availability of P* from various phosphates applied to different soil types; phosphate-wood waste (waste liquor from sulphite pulp mills and hydrolysed sawdust) and radio-active P.

Interrelationship of *microbiological action* in soils and cropping systems. Factors affecting growth of legume bacteria and nodule development.

Soils. Composition of Florida soils and of associated native vegetation. Significance of levels of readily soluble major nutrient elements removed by various extraction procedures from Florida soils under different cropping practices. Retention and utilization of B. Sulphur-manganese studies in peat and muck soils of the Everglades. Biology and control of cut worms and army worms.

Hawaii.—*Fertilizers.* Fertilization with N, P, K and lime of Napier grass under

grazing. Sugar cane and K fertilizers. *Lime requirements* of acid soils. *Dolomitization* in calcareous soils. Physical treatment and soil Mn. Influence of oxidation-reduction systems on plant growth. *Plant-hormone* investigations in sugar cane.

Kentucky.—*Fertilizers.* Effect on stand and yield of wheat of drilling fertilizer in contact with seed. Fertilizer tests on corn on overflow land. Placement of fertilizer for burley tobacco. Split application of N fertilizer on potatoes. Effect of N on lima beans. Comparison of super. and rock phosphate on sandstone soil. Residual phosphorus in soil after heavy applications of rock phosphate and super. Radio-active fertilizer for field crops. Effect of strawberry mulch on soil N.

Control of life histories of *wireworms*. White-grub control.

Nebraska.—*Erosion control* and moisture conservation. Infiltration rate of *irrigation water*. Dry-land *crop rotations*. *Barley fertilizer* and seed treatment tests. *Soil microbiology.* Percolation as influenced by soil micro-organisms; microbial population with stubble mulch; decomposition of crop residues by soil fungi; nitrification.

Purdue.—*Soils and cultivation.* Studies of cumulative effect of different systems of soil treatment and crop management on the fertility of Indiana soils. Effect of water levels on yield and quality of crops and on physical characteristics of the soil. Survey of iodine in water, soil and crops of Indiana. Crop residue management and mulch tillage experiments with vegetables. *Fertilizers.* Effect of different systems of soil management and fertilizer treatments on apple and stone-fruit trees. Effect of ploughing-under fertilizer, response to various P fertilizers and to N, effect of soybeans on clover stands. Comparative efficiency of different P fertilizers for field crops.

Condensation and absorption of atmospheric water as a source of soil moisture. Revegetation of coal-mine spoil banks.

Wyoming.—Study of *absorption of selenium* by forage plants through their roots. *Fertilizers on sugar beet:* placement and availability. *Weed control* with 2,4-D. Frequency of *irrigation*.

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages. Where the Bureau has only seen an abstract, and not the original paper, no language indication is given.

Original (untranslated) titles of papers are only given where the Latin script is used.

Where more than one reference is given, the first is to the original paper, the others to notices in abstract journals. A key to the abbreviations used in the references is contained in the Bureau's *Bibliography of Soil Science, Fertilizers and General Agronomy*.

631.3 AGRICULTURAL EQUIPMENT

- [1] 631.333
CUMMINGS, G. A. **Application machinery for fertilizer.** *Agric. Chem.* 2, 1947 (21-24, 63). [U.S.D.A. Agric. Res. Admin.]

A discussion in general terms of present-day trends in the development of machinery for applying fertilizers.

631.4 SOILS

- [2] 631.4
JACKS, G. V. **Pedology.** *Sci. Prog.* No. 140, 1947 (705-712).

Review of recent work on soil classification, soil geochemistry and the role of micro-organisms in structure-formation.

631.41 SOIL CHEMISTRY

(See also Abs. Nos. 140, 142, 240, 331)

- [3] 631.411.2 : 631.81
DAS, S. **Plant-food requirements of calcareous soils. I. Optimum requirements of phosphorus for Pusa calcareous soils. II. Optimum requirements of nitrogen for Pusa calcareous soils.** *Indian J. Agric. Sci.* 16, 1946 (221-228, 229-234). [Imp. Agric. Res. Inst., New Delhi]

I. Dressings of 60, 70 and 80 lb./acre of P_2O_5 with basal NK dressings gave maximum yields of oats, ragi and mustard, respectively, in pot and field experiments on soils containing 30-40% of $CaCO_3$. The P content of ragi grain increased, the N content decreased, and the K content did not vary, with increasing P applications. Good correlation was obtained between yield increase and K_2CO_3 -soluble P, but not citric-soluble P.

II. 80 lb./acre of N applied as apricot-seed cake or 40 lb./acre as $(NH_4)_2SO_4$ with basal PK gave maximum yields of wheat. The N content increased, the P content decreased and the K content did not vary, with increasing doses of N.

- [4] 631.411.4
ROSEVEAR, D. R. **Mangrove swamps.** *Farm and Forest* 8, 1947 (23-30). [Forestry Dept., Nigeria]

The typical soil of mangrove swamps in Nigeria is a blue alluvium, discoloured to a brownish-grey on the surface. It gradually becomes hardened and converted into a thick felt raft of peaty texture. The displacement of the mud by capillary rootlets of *Rhizophora* results in the raising of the general surface level until the area is only shallowly flooded at highest tides. Deposition of coarser detritus and of leafy and woody material together with the breaking down of the peat results in a more normal soil. The mature mangrove so changes the nature of the soil that a further crop on the same site is not possible and at present no obvious way of regenerating the mangrove forest seems possible.

- [5] 631.411.4 : 631.81
NEW ZEALAND DEPARTMENT OF AGRICULTURE **Experiments on peat soil.** *N.Z. Dept. Agric. Rept.* 1946-47, 1947 (48).

On a peat swamp there was marked increase in growth on all plots receiving N fertilizers applied either as NH_4NO_3 , $(NH_4)_2SO_4$ or $NaNO_3$. The effect of 1 cwt. of NH_4NO_3 had largely worn off after 6 weeks and of 5 cwt. after 8 weeks, whereas the plots receiving 20 cwt. were still conspicuously green after 4 months. 20 cwt. suppressed clovers and stimulated rye grass.

Combinations of lime, serpentine super. and muriate of potash enhanced the response to N, but when applied without N these fertilizers had little effect. Oxidizing agents such as KMnO_4 , incorporated into the top few inches of peat before sowing, improved the establishment of new pasture. Heavy liming to reduce acidity of peat (pH 3.5-4.0 on untreated areas) has so far given no response.

[6] 63I.411.9
CLAVER ALIOD, M. Contribucion al estudio de los suelos silicico-humicos de la Sierra de Guadarrama. [Humus-silicate soils of the Sierra de Guadarrama]. *An. Inst. Esp. Edafol.* 6, 1947 (5-52). [Sp.]

Micromorphologically, the alpine level exhibits peaty soils near the summits and at a lower altitude humus-silicate soils with an upper horizon of raw humus above fine humus passing directly to parent rock. The foothills show types of evolution towards grey soils. In spite of the skeletal character of the soils studied the organic content could be only very approximately deduced from inspection of the losses on ignition. C content was generally low, and the C/N ratio very variable. Total exchangeable bases decreased with depth, in accordance with decreasing clay and organic matter. The clay held approximately $\frac{1}{2}$ of these bases. Capillary analyses and chromatograms of extracts in 1% NaF showed uniformity between the samples. The proportion of fulvic and humic acids increased with depth and was highest at low altitudes.

[7] 63I.414.2 : 549
BASTISSE, E. M. Contribution à la détermination du type minéralogique des argiles des sédiments, sols naturels en place et terres de cultures. [Contribution to the determination of the mineralogical type of clays from sediments, natural soils in position and cultivated ground.] *Ann. Agron.* 17, 1947 (398-454). [F.] [Centre Nat. Rech. Agron., Versailles]

Unfractionated and granulometrically fractionated samples of well studied groups of sediments, namely kaolinites, illites, montmorillonites and attapulgites were analysed (1) physically (losses on ignition between 100°C. and 1000° in stages of 50°, expressed as dehydration curves; curves of

differential thermal analysis), (2) chemically (SiO_2 , Al_2O_3 , total Fe, CaO, MgO, K_2O , Na_2O), and (3) physico-chemically on the finer clay fraction of 30 samples (pH, base-exchange capacity with CaO, neutralization curves with alkalis). The indications of (3) showed no correlation with the nature of the sediments studied; the other analyses showed considerable differences between the members of any one group, both for unfractionated and fractionated samples. This difficulty in mineralogically characterizing a sediment was yet greater with the natural and cultivated soils studied, in view of phenomena of degradation and of alteration of original mineral constituents; the classification presented in this study is based mainly on loss on ignition, and on the shape of the dehydration curves.

The investigation provided evidence of the possible existence in siliceous minerals of groups Si-Si and Si-Al having single saturated or multiple unsaturated bonds, which break at about 800-900°C., causing increases in weight up to 2% through oxidation.

[8] 63I.414.2 : 63I.8I
SMITH, A. M. Hardpan, plowsole, and compacted soils. *Amer. Fert.* 107, No. 9, 1947 (9-10, 28-30).

The physical effect of impervious layers of soil near the surface in both humid and dry areas is to reduce the effective moisture supply available to crops. A summary is given of investigational work done in U.S.A. on hard pans, clay pans and silt pans, and it is stressed that biological and chemical reactions resulting from heavy manuring and fertilizing should be studied in their effect on soil tilth, structure, aeration, drainage and capillary-water capacity.

[9] 63I.414.3.03 ; 63I.44
DAS, S. ; MUKHERJEE, S. K. ; SEN, A., ET AL. Comparative studies on Indian soils, III. Base exchange properties. *Indian J. Agric. Sci.* 16, 1946 (234-245). [Imp. Agric. Res. Inst., New Delhi]

43 Indian soils (33 containing CaCO_3) were grouped into 3 classes according to whether the base-exchange capacity increased or decreased from the surface downwards, or reached a maximum at some intermediate

depth. Ca was the major exchangeable cation, followed by Mg, Na and K. Mg was high in black and black cotton types, Na in saline soils. Calcareous soils had high base-exchange capacities.

[10] 631.414.2 : 631.445.7
CAILLÈRE, S. ; BÉTRÉMIEUX, R. ; HENIN, S.
Examen des argiles de quelques sols tropicaux. [Investigation of the clay of some tropical soils.] C.R. 225, 1947 (818-820). [F.]

X-ray analysis showed the clay fractions of 10 soils from the Chad and Ivory Coast areas to be largely kaolinitic, with some illite in the most fertile soils. Thermal analysis showed the exothermic phenomenon to occur at the rather low temperature of about 800-900°C., this being attributed to the presence of strongly combined Fe in the mineral. The endothermic peak was of variable importance, appearing particularly small in unfertile soils, a fact which, if corroborated, should be of use in judging the fertility of tropical soils.

[11] 631.415.1 : 545.371/2
DAVIS, J. F. ; LAWTON, K. A comparison of the glass electrode and indicator methods for determining the pH of organic soils and effect of time, soil-water ratio, and air-drying on glass electrode results. *J. Amer. Soc. Agron.* 39, 1947 (719-723). [Mich. St. Coll., East Lansing]

The pH values of 50 random samples of organic soils were found by the Lamotte-Morgan indicator method, and then by the glass electrode method in which 15 ml. of soil and 15 ml. of distilled water were stirred for 1 minute and the pH determined immediately, after 15 minutes, and again after 60 minutes. These 3 readings and the indicator reading agreed very closely. The use of soil : water ratios of 1 : 0 and 1 : 2.5 by volume was equally satisfactory for practical purposes.

Air drying of samples before re-wetting and determination of pH, caused no significant change in the pH. With air-dried samples, a 1 : 2 soil : water ratio was used because 1 : 1 did not allow sufficient wetting of the soil paste for satisfactory operation of the electrode.

The electrode method is the more rapid, and in late winter and early spring is rather the more accurate with well-decomposed

soils, whose state of high dispersion during those seasons somewhat interferes with the accuracy of the indicator method. For field purposes the indicator method is more satisfactory, as it requires no source of current.

[12] 631.415.1 : 545.372
SCHOLLENBERGER, C. J. A glass electrode assembly for soil pH determination. *J. Assoc. Off. Agric. Chem.* 30, 1947 (555-562). [Agric. Expt. Sta., Wooster, Ohio]

Matched half cells for a glass electrode assembly to be used with a pH meter in examining wetted soil, etc., in a beaker or flask, are described, with details of their simple construction from readily obtainable parts. The spear type pH-sensitive bulb is easily blown from Corning 015 glass tubing, is not sealed to other glass but rather attached to permit replacement, and is shaped to give maximum strength and sensitivity and to penetrate the soil mass with minimum risk of fracture. The internal element is a quinhydrone electrode in decinormal hydrochloric acid. A pore type liquid junction in a combined salt bridge and saturated potassium chloride-calomel half cell (considered best for use with soils) is described. In performance, this assembly has compared favourably with commercial glass electrodes. Formulae are given for buffer standards to be used for setting the meter and testing electrodes.

[13] 631.415.1 : 546.711
HEWITT, E. J. The resolution of the factors in soil acidity : some effects of manganese toxicity. *Long Ashton Agric. Hort. Res. Sta. Rept.* 1946 (50-55). Appendix (55-61).

Many of the typical effects of growth in acid soils can be reproduced in cauliflower and other vegetables by suitable combination of Mn toxicity and inadequate Ca supply. Unusual symptoms seen in potatoes growing in an acid soil and termed "central necrosis" were reproduced in these sand culture experiments by a combination of K and Ca deficiency with Mn toxicity. The visual effects of injury caused by Mn toxicity were distinct from those induced by Fe.

[14] 631.415.1 : 631.416
TRUOG, E. Soil reaction influence on availability of plant nutrients. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (305-308). [Univ. Wis.]

A chart shows the relationship of soil reaction to the availability of Cu, Zn, B, Mn, Fe, Mg, Ca, S, K, P and N.

For S, K, Ca and Mg, conditions associated with acidity are unfavourable for availability. The most favourable pH range for P availability is 6.5-7.5. Below pH 6.5 the conditions become rapidly less favourable. The most generally favourable reaction for the availability of all the elements listed is pH 6.5.

[15] 631.415.3
MUKERJI, B. K.; AGARWAL, R. R.; MUKERJI, P. **Studies in Gangetic alluvium of United Provinces. I. Cultivated soils of Unao district.** *Indian J. Agric. Sci.* 16, 1946 (263-280).

Three genetic types have been observed (1) immature salty alkali soils, (2) salty alkali soils either with or without a zone of CaCO_3 accumulation, (3) degraded salty alkali soils.

[16] 631.415.3
PLICE, M. J.; EMERSON, R. L. **Some bionomic and other characteristics of slick-spot soils in Oklahoma.** *Proc. Okla. Acad. Sci.* 27, 1947 (97-101). C.A. 41 (7032).

Slick spots, caused by Na salts which had been present and leached out, drain badly and are foci for erosion. Best results were obtained with gypsum, and second best with gypsum and manure.

[17] 631.415.36
✓ HAYWARD, H. E. **The control of salinity.** *U.S.D.A. Yrbk.* 1943-1947, 1947 (547-553). [U.S. Reg. Salinity Lab., Riverside, Calif.]

A survey of measures employed to control salinity. Research on plant-water relationships in saline soils is mentioned, and several crops are classified with regard to their salt tolerance.

[18] 631.415.36 : 631.67
MCGEORGE, W. T. **Corrective measures for the salinity problem in southwestern soils.** *Better Crops with Plant Food* 31, 1947 (19-22, 45-49). [Ariz. Agric. Expt. Sta.]

Relationship between white and black alkali and salinity-alkali-soil relationships are discussed. It is pointed out that the ideal soil corrective is a mixture of gypsum,

S and manure. Control measures are, however, more efficient and economical than reclamation measures. The quality of the water is the first thing to be considered. Hard water, i.e. water in which Ca is in excess of Na, is essential for agriculture. When such water is unavailable, applications of gypsum should be made to the irrigation water or light annual applications of gypsum or S to the soil. The number of irrigations, interval between irrigations and quantity of water used are also important. Substantially more water must be applied to cropped land than that lost through evaporation and transpiration in order to prevent accumulation of salt in the soil. This excess should be used to flush the soil and not be spread thinly over a series of irrigations.

[19] 631.415.36 : 631.821.2
ALADJEM, R. **Expériences sur les terres alcalines effectuées par la Section Chimique de la Société Royale d'Agriculture pendant la période 1938-1944. [Experiments on alkali soils during 1938-1944 by the Chemistry Section of the Royal Society of Agriculture.]** *Bull. Un. Agric. Égypte* 370, 1947 (85-91). [F.]

An abridgement of A. Mahmoud Bey's report on the reclamation of impervious alkali soils at Birket al Hagg, that everywhere contained toxic amounts of Na_2CO_3 , with high proportions of NaCl and Na_2SO_4 in parts. The area was provided with subsurface drainage and flooded for 7 months, but the salts remained and sown rice completely failed. The total amount of gypsum required was calculated from analyses, and ploughed in deeply before rice, the land being left flooded for a month. Permeability and drainage improved within 5 days and at the end of the flooding the soil was suitable for rice. Where water is scarcer and mould-board ploughs unobtainable, the gypsum should be added in several applications, each followed by a tillage and flooding.

631.416/7 **COMPOSITION OF SOILS**
(See also Abs. Nos. 22, 43, 47, 48, 50, 51, 98, 220, 336, 338, 391)

[20] 631.416 : 553.72
BAEYENS, J.; APPELMANS. **Studies op de in 1944 overstroomde poldergronden in België, 2^e mededeeling: Vegetatieproeven in**

1946. [Studies of the inundation of polder lands in Belgium, second report : vegetation tests in 1946.] *Agricultura, Bijzonder Nummer*, Feb. 1947, pp. 122. [Fl.e.f.g.]

Observations were made of changes in the soil caused by inundations with seawater, and the most favourable methods for recovery of the polders were investigated. Plants germinated slowly, due not only to Na but also to an increase in the concentration of Cl in the soil moisture. Inundation lowered the reaction of the soil moisture. With lixiviation of the soil the pH increased quickly. Application of gypsum and CaCl_2 quickly changed the Na-clay into Ca-clay and restored the soil to a more normal state. Activity of nitrifying bacteria is impeded by salt, but when the salt content is decreased to 0.2%, nitrification is stimulated. Microbial activity probably did not suffer much from superfluous salt or from anaerobic conditions.

[21] 63I.416: 63I.81
PAAUW, F. VAN DER. Onderzoekingen over fosfaat- en kalibemesting op de kleigronden van de Zuidhollandsche Eilanden. [Investigations on phosphate and potash manuring of the marine-clay soils of the isles in the Province of South-Holland.] *Versl. Landbouwk. Onderzoek.* 53, 5A, 1947 (213-246). [Du.e.]

Both the P-citric-acid number (P-citr) of the soil (phosphate soluble in 1% citric acid) and the K-HCl number (K soluble in 0.1 n. HCl) were correlated satisfactorily with increases in yield obtained by manuring with P and K respectively. For P this relation was constant with clay soils, whereas for K a difference of 10% clay content corresponded to a difference in the K-HCl number of about 2-4 units. The response to P manuring appeared to depend on the Ca content of the soil, the greatest effect being obtained with a CaO content of 3-6%. The time of application of P—before ploughing in the autumn or after ploughing in the spring—was of no great importance. Application of K before ploughing in the autumn was more effective than a spring application.

[22] 63I.416: 63I.417
KOJIMA, R. T. Soil organic nitrogen : I. Nature of the organic nitrogen in a

muck soil from Geneva, New York. *Soil Sci.* 64, 1947 (157-165). [U.S.D.A. Beltsville, Md.]

By the decarboxylation method about 37% of the total N of the muck soil was accounted for as α -amino N. Alkaline hydrolysis of the soil yielded as much humin N as acid hydrolysis did, and it is concluded that most of the humin N is already present in soil as non-protein material, perhaps as complex, heterocyclic N compounds. On the basis of amino- and amide-N determinations on the products of hydrolysis, at least 50% of the total organic N in the muck soil may be protein in nature. On the results of alkaline hydrolysis, not more than 66-75% of the total organic N in the muck soil can be considered protein nitrogen.

[23] 63I.416: 63I.417
KOJIMA, R. T. Soil organic nitrogen : II. Some studies on the amino acids of protein material in a muck soil from Geneva, New York. *Soil Sci.* 64, 1947 (245-252).

The object of the investigation was to identify and determine quantitatively the amino acids derived from soil protein by hydrolysis with concentrated HCl for 24 hours. The mono-amino acids, which constitute about 90% of the hydrolysable amino N, were particularly studied.

The dicarboxylic-acid fraction of the hydrolysates contained about a quarter of the total amino N, 20-30% of this being accounted for by aspartic acid isolated as the Cu salt. Glutamic acid, determined indirectly by conversion to pyrrolidone-carboxylic acid accounted, with hydroxy-glutamic acid, for another 21%, the nature of the remaining amino acids in this fraction being undetermined.

Leucine, isoleucine and valine isolated by fractionation of Cu salts accounted for 31.9% of the amino N, or 42.5% of the mono-amino-monocarboxylic-acid fraction. Hydroxy-amino acids determined by the periodate method accounted for 18% of the total amino N.

The acids isolated indicate no unusual characteristics of the protein or protein fragments in the muck. Tryptophan was completely absent, but its heterocyclic N may be the source of part of the humin N.

[24] 631.416.2 : 631.411.2
DAS, S. **The vertical distribution of phosphates in calcareous soils.** *Indian J. Agric. Sci.* 16, 1946 (164-168). [Imp. Agric. Res. Inst., New Delhi]

Phosphate concentrations in different layers of calcareous soils generally poor in P varied inversely with the CaCO_3 content. P added annually as super. did not penetrate below the first foot.

[25] 631.416.2 : 631.414.3
OWEN, G. **Retention of phosphates by Malayan soils. I. The nature of phosphate retention in different soil types. II. Penetration in soils and absorption by plants.** *J. Rubber Res. Inst. Malaya* 12, Commun. 262, 1947, pp. 46.

All local Malayan soils have a very high capacity for fixing P in a difficultly available form. In the sedentary inland soils the degree of fixation is closely correlated with the percentage of clay in the soil. Maximum fixation occurred at about pH 2.6-2.7. P availability was increased by the use of N fertilizers. Coastal alluvial soils did not show the same close correlation between the degree of fixation and percentage of clay in the soil as did the inland soils. There was a close agreement within each soil profile, but not between soil types. This suggests that some factors other than mechanical composition also govern the degree of retention of P. Nearly all the P was retained in all soils within three inches of the point of penetration. These tests were under laboratory conditions, and under field conditions the penetration would probably be much less. Placement methods were the most satisfactory methods of treating these soils.

[26] 631.416.2 : 631.414.3
TOTH, S. J. ; BEAR, F. E. **Phosphorus-adsorbing capacities of some New Jersey soils.** *Soil Sci.* 64, 1947 (199-211).

Samples of 17 soils were brought to a standard H state by leaching with 0.05 n. HCl and washing out the chlorides with distilled water. Total P content of the surface horizons averaged 0.043% and the P-adsorption capacity ranged from 0.03 m.e. of P per 100 gm. to 64.4 m.e., in a few cases being lower than in the soil's original state due to loss of Fe and Al in the HCl treatment. Liming to pH 6.5 markedly reduced P

adsorption, e.g. from 64.4 m.e. to 31.6 m.e. in the A horizon of a silt loam. Adsorption was greatest in the A horizons of some and the B horizons of other soils, while in the remaining profiles it was uniform in all 3 horizons. In 5 of 6 soils tested, P application to the maximum absorption value was correlated with maximum increase in exchange capacity.

[27] 631.416.2 : 631.415.1
SENB, G. ; HOVLAND, G. **Undersøkelser over surhetsgrad og fosfattilstand på to jordstykker i 1940 og 1945. [Investigation of soil reaction and phosphate status of two fields in 1940 and 1945.]** *Norsk. Landbr.* 1946 (179-184). [N.]

The P status and soil reaction of two experimental fields were analysed in detail with a five-year interval during which no P fertilizers were applied. From the analyses it is clear that in fields on which the lime and P status had been satisfactory little deterioration took place over five years. 90% of the samples had no P requirement. An estimation of the amount of P applied to the fields and that lost by cropping over a period of 25 years showed that about twice as much P_2O_5 had been applied as was taken up by the crops. The importance of soil reaction in connexion with available P is stressed.—S.H.

[28] 631.416.2 : 631.417
MATTSON, S. ; KOUTLER-ANDERSSON, E. **The acid-base condition in vegetation, litter and humus : 10. Some properties and functions of phytin.** *LantbrHögsk. Ann.* 14, 1947 (290-300). [E.]

The solubility of phytin (inositol hexaphosphoric acid) in cereals, peas and all systems containing protein and Ca and Mg ions passes through two minima. At low pH phytin is precipitated by protein, and at high pH by Ca and Mg ions. The pH of the intervening maximum solubility varies with the proportion of the two types of precipitants. This double fixation of phytin has its counterpart in the soil, where P_2O_5 combines with the Al and Fe hydrogels at low pH and with Ca ions at high pH, with a maximum solubility between. Ca ions suppressed phytin hydrolysis by phytase, but albumin caused no measurable suppression. Albumin forms a series of phytinates

whose isoelectric point is lower the higher the proportion of phytin, and which are analogous to the protein humates prepared by Mattson.

[29] 631.416.4 : 631.83
PAAUW, F. VAN DER. Kalitoestand en kalibemesting. [Potash condition and potash fertilizing.] *Landbouwk. Tijdschr.* 1944 (141-150). Biol. Abs. 21 (1490). [Da.]

Sandy soil samples containing a fixed amount of humus were extracted with HCl for K determinations of Dutch soils and the K figures thus obtained were used as indications for K fertilizing. It is shown by 2 examples of potatoes and grassland that this is roughly justified. Heavy applications of K fertilizer may depress crop yields.

[30] 631.416.871.1 : 631.453
KIPPS, E. H. The calcium : manganese ratio in relation to the growth of lucerne at Canberra, A.C.T. *Aust. J. Coun. Sci. Indust. Res.* 20, 1947 (176-189). [C.S.I.R., Divn. Pl. Indust., Canberra]

The unsatisfactory growth of lucerne on the savanna soil of Canberra is attributed to high exchangeable-Mn content of the soil together with inadequate available Ca. Raising the degree of base saturation of the soil and the pH to above 6.7 reduced Mn availability to a minimum and permitted satisfactory growth. Further increase in yield followed as available-Ca supply was increased. A correlation exists between the Ca/Mn ratio in the plant, and the health and yield of the crop. Healthy plants had a Ca/Mn ratio greater than 66 : 1.

[31] 631.416.873 : 619
HARKNESS, D. Moor sickness. *Vet. Rec.* 59, 1947 (73-74). Nutr. Abs. 17 (285).

"Bodmin Moor sickness" is similar to cobalt pine and has been known for many years on the granite moors of Cornwall. On the affected farms the soil contains 0.02 to 0.07 p.p.m. of Co in some fields. Other fields show a higher Co content and are used for pasturing affected sheep. Removal to lowland pastures for 2 to 3 weeks twice a year is said to prevent the disease; an old-established treatment was drenching with soil from lowland pastures.

[32] 631.417 : 631.43
CHENG, K. L. [Effects of organic matter and lime on the physical properties of Chengtu clay.] *Soils Quart.* 6, No. 1 (19-24). [Ch.]

[33] 631.417.2
TROCME, S.; BARBIER, G. Observations sur les propriétés colloïdales d'acides humiques d'origine diverse. [Observations on the colloidal properties of humic acids of different origins.] *Ann. Agron.* 17, 1947 (346-364). [F.] [St. Cent. d'Agronomie Versailles]

These preliminary experiments investigated the relationship between the properties of humic acids and the age of the humus from which they were obtained. The acids were extracted from (1) the liquid in the sump below a manure heap, (2) old vegetable mould, (3) peat and (4) lignite, forming a series of increasing age that was found to be divisible into two groups, namely the younger (1) and (2), which as Ca humates resisted flocculation by electrolytes, were light in colour and were easily dispersed in water (being therefore more able to form clay-humus complexes in the soil); and the older (3) and (4), which were easily flocculated, dispersed with difficulty, and had a dark colour. The base-absorbing capacity of the acids and their reducing action on permanganate varied only slightly, as did the readiness of the Ca humates to exchange Ca for alkaline ions. All the humates were adsorbed in considerable quantities by clay, there being no correlation between the degree of this adsorption and their flocculation by salts.

As the acids of the younger group were formed under more or less aerobic and alkaline conditions, and the older under anaerobic and acid, the observed differences in their properties cannot be attributed to any single cause. However, of the humates studied those formed under aerobic and alkaline conditions were the more easily dispersible, providing a point of analogy with Pallmann's observation that lignin oxidizes more easily in an alkaline medium, and is more easily dispersed, at a given pH, the greater its degree of oxidation. This is strictly limited analogy, as the base-absorbing capacity of lignin increases with oxidation, whereas the humic acids of anaerobic origin were found to have a rather greater base-absorbing capacity than the others.

[34] 631.417.2 : 537-531
JUNG, E. [The fine structure of humus substances. (A). X-ray investigations of humus substances. (B). The question of the fine structure

of humic acids.] *Ztschr. Pflanz. Düng.* 37, 1946 (2-16). C.A. 41 (5772). [G.] [Inst. Geol. Bodenlehre, Landwirtschaftl. Hochschule, Hohenheim]

X-ray investigations on brown coal, peat, soil humus from black earth formations and the humic acids obtained therefrom showed the high-moor peat to be amorphous and the other humus substances to contain slight amounts of crystalline C in an amorphous organic ground mass. Coking tests were made with the humic acids. On the basis of the results of such tests, the possibility of the formation of graphite crystals on the surface of soil minerals as a result of the decomposition of the adsorbed humus is explained. It is concluded that the humic acids are not crystalline but consist of crystallites of graphite structure in an amorphous-mesomorphous ground mass.

[35] 631.417.2 : 631.42
FORSYTH, W. G. C. ; FRASER, G. K. **Freezing as an aid in the drying and purification of humus and allied materials.** *Nature* 160, 1947 (607). [Macaulay Inst., Aberdeen]

In work on soil organic matter it is difficult to filter and dry acid-precipitated flocculae of humic acids because of their bulk, colloidal character and water-retaining capacity. The raw materials (soil, peat or decomposed vegetable matter) may be extracted with dilute (2%) caustic soda and the alkaline extract acidified with H_2SO_4 to a pH of 3. The precipitated humus is allowed to settle and, after the supernatant liquor has been siphoned off, is frozen to $-3^\circ C$. It is then allowed to thaw, the colloidal properties are destroyed and the solid and aqueous phases separate. The solid is in a condensed form as irregular microscopic flakes, and is readily filtered, washed and because of its small bulk and non-adsorptive powers is readily dried by standard methods.

[36] 631.417.792
TURFITT, G. E. **Microbiological agencies in the degradation of steroids. II. Steroid utilization by the microflora of soils.** *J. Bact.* 54, 1947 (557-562).

The microflora of soils was tested for ability to utilize a variety of steroid materials. Steroids with a very few exceptions are attacked by *Proactinomyces*, these being the predominant organisms in steroid decom-

position in soils. Steroid decomposition by *Penicillium*, *Aspergillus* and *Alienaria* was negligible.

631.418 SOIL SOLUTION

[37] 631.418
GORBUNOV, N. I. ; TSIURUPA, I. G. [The unequal concentration of the solution extracted from clay minerals and soils.] *Pedology* 1947 (167-171). C.A. 41 (6650). [R.e.]
Zeolitic material, askanite, kaolin and several samples of chernozem were saturated with Ca, Mg and Ba. These were then treated with 0.1 N. NH_4Cl at ratios of solid to liquid 1 : 2 and 1 : 3. Upon interaction, the mixtures were subjected to various pressures from 50 to 200 kg./sq.cm., and the solutions were analysed. It is shown that with the higher pressure the concentration of the extracted solution was lower; this proves that the concentration of electrolytes at the interphase is lower. With pressures of 1, 12, 25, 50 and 150 kg. it is shown that at first the concentration is low, becomes higher when the pressure is increased and lower again when the highest pressure is applied. These data show how the concentration of electrolytes varies around the soil particles.

[38] 631.418
SHAVERGIN, P. I. [The relation between soil solutions and water extracts in salinized soils.] *Pedology* 1947 (172-177). C.A. 41 (6650). [R.e.]

The water extract gives more salts in solution than the soil solution, showing that appreciable quantities of the salts are in the solid phase. The $CaSO_4$ in soil solution does not exceed 8-12% of that found in soil water extract; $Ca(HCO_3)_2$ does not exceed 10-53%, Na_2SO_4 60-80%, $MgSO_4$ 85-90%. Soil solution contains more NaCl than water extracts, owing not only to its high solubility but also to its negative adsorption.

631.42 TECHNIQUE AND ANALYSIS
(See also Abs. Nos. 35, 132, 133, 135, 137, 151, 234, 260, 283, 324.)

[39] 631.42
CHILDS, W. H. **Shredded sphagnum vs. peat and sand as a medium for transplanted blueberry seedlings.** *Proc. Amer. Soc. Hort. Sci.* 47, 1946 (206-208). [W. Va. Agric. Expt. Sta.]

Half the seedlings were grown in shredded sphagnum and the rest in a 1-1 peat-sand mixture. All plants received the same greenhouse treatment including applications of nutrient solution at 2 to 3-week intervals. Shredded sphagnum proved distinctly superior as a rooting medium under these conditions.

[40] 631.42 : 535.82
FREI, E. Mikromorphologische Bodenuntersuchungen anhand von Dünnschliffen. [Micro-morphological soil investigations by means of thin sections.] *Mitt. Lebensm. Hyg.* 38, 1947, pp. 6. Reprint. [G.]

A short description of the preparation of microscope slides of soils is followed by an illustrated account, in general terms, of the type and interpretation of information which thin sections make available concerning the inorganic and organic constituents and varied structures of soils, and the movement and deposition of soluble salts.

[41] 631.421
HOMEYER, P. G. ; BLACK, C. A. Sampling replicated field experiments on oats for yield determinations. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (341-344). [Iowa Agric. Expt. Sta.]

In order to discover the most efficient methods of sampling, the relative efficiencies of several sampling designs were measured and estimates were also made of the loss of information from different rates of sampling.

The 3 × 3-foot quadrat was a slightly more desirable size of sampling unit for oats than the 2.178 × 2-foot quadrat when considering both statistical efficiency and time required to take the samples. Also plot yields estimated from samples taken with the larger quadrat were less biased than were those estimated from the samples taken with the smaller quadrat. A sampling design based on Latin-square arrangements was the most efficient. Although strips cut lengthwise through the centre of each plot with a power mower gave the largest sampling error, it is tentatively concluded that this loss is compensated by decreased labour requirements.

[42] 631.422
WOLF, B. ; ICHISAKA, V. Rapid chemical soil and plant tests. *Soil Sci.* 64, 1947 (227-244). [Seabrook Farms, Bridgeton, N.J.]

A method, based on the use of Morgan's extracting solution (n. sodium acetate buffered at pH 4.8), is described for the analysis of soluble nutrients N, P, K, Ca and Mg in soils and plants and total nutrients in plants. Greater accuracy has been achieved by making certain changes in reagents and procedure, and by using a photoelectric colorimeter. Activated charcoal is used to provide clear soil filtrates. The use of clean apparatus and strict adherence to procedure allows an accuracy of ± 10% to be attained.

The method was used to determine the nutrient requirements of spinach.

[43] 631.423
COLLIER, D. L'analyse chimique élémentaire des sols et des roches en pédologie. [Elementary chemical analysis of soils and rocks in pedology.] *Ann. Agron.* 17, 1947 (329-345). [F.] [Sta. Rech. Chim., Clermont-Ferrand]

The method described is a simplification of classical methods and includes the use of more rapid techniques practicable in series. In the first series, 1 gm. of soil or rock is fused with Na₂CO₃ and SiO₂, Al₂O₃, P₂O₅, Fe₂O₃, TiO₂, CaO and MgO are determined in turn, and in the second, after water content and loss on ignition have been found in the usual way, K and Na are determined by heating with H₂SO₄ and HF. Precautions against experimental error are discussed, the range of error being 5-10% for TiO₂, 0.5-1% for SiO₂ and CaO, and 2-3% for the rest. Very little apparatus is needed and 6 complete analyses may be done by one person in a week, given sufficient platinum dishes.

[44] 631.423
PEECH, M. ; ALEXANDER, L. T. ; DEAN, L. A., ET AL. Methods of soil analysis for soil-fertility investigations. *U.S.D.A. Circ.* 757, 1947, pp. 25.

Methods are described for the preparation of soil samples and for the determination of readily soluble P, of pH, organic matter, exchangeable cations and exchange capacity. These methods gave satisfactory indices to soil fertility when applied to acid, highly fertile soils of the Atlantic and Gulf Coast States. Many of the methods would be less satisfactory if applied to calcareous and alkaline soils.

[45] 631.423 : 544.6
MITCHELL, R. L. **Spectrographic analysis of plants and soils.** *Biol. Rev.* 22, 1947 (1-29). [Macaulay Inst., Aberdeen]

A review of methods, including those employing flame, arc and spark excitation. Some 70 elements can be determined spectrographically, the most important exceptions being gaseous and non-metallic elements.

[46] 631.423 : 544.6
MITCHELL, R. L. ; SCOTT, R. O. **Concentration methods in spectrographic analysis. II. Recovery of trace constituents in plant materials and soil extracts by mixed organic reagents.** *J. Soc. Chem. Indust.* 66, 1947 (330-336). [Macaulay Inst., Aberdeen]

A concentration method, employing precipitation by means of a mixture of 8-hydroxyquinoline, tannic acid and thionalide, is described for the simultaneous recovery of Co, Ni, Mo, Cr, V, Be, Ge, Sn, Pb, Ti and Zn from solution in a form suitable for spectrographic analysis. Combined spectrographic and chemical errors seldom exceed $\pm 10\%$ for individual determinations. The ranges covered are 2-50 μg . for Co, Ni, Mo, Cr and V, and 5-100 μg . for the other elements except Zn, where the range is 0.2-4 mg. Details are given for the application of the method to the determination of trace constituents in plant materials and soil extracts. The use of other organic reagents in conjunction with 8-hydroxy-quinoline is also discussed.—Author's summary.

[47] 631.423.3 : 631.416.1
DROUINEAU, G. ; GOUNY, P. Contribution à l'étude du dosage de l'azote nitrique par la méthode Devarda. [Estimation of nitrate nitrogen by the Devarda method.] *Ann. Agron.* 17, 1947 (154-164). [F.]

Reduction of nitrates by Devarda's alloy is interfered with by Si released from glass vessels during the initial boiling with NaOH. The amounts of Devarda's alloy should be increased to at least 2 gm. when moderate amounts of Si (20-100 mg.) are present. The method cannot be used when large amounts of Si are present.

It is recommended to use MgO in place of NaOH and to determine $\text{NH}_3\text{-N}$ and $\text{NO}_3\text{-N}$ consecutively in the same sample. After removal of $\text{NH}_3\text{-N}$ the Devarda's alloy is added and $\text{NO}_3\text{-N}$ determined.

[48] 631.423.3 : 631.416.2
ARNOLD, C. Y. **Analyses of vegetable fertilizer plots with a soil test which measures acid-soluble and adsorbed phosphorus.** *Soil Sci.* 64, 1947 (101-109). [Ill. Agric. Expt. Sta.]

Determinations of P soluble in (1) 0.1 n. HCl + 0.03 n. NH_4F , (2) 0.025 n. HCl + 0.3 n. NH_4F and (3) 0.025 n. HCl + 0.24 n. $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$ in soils which had received very large applications of fertilizers for 10 or more years in order to see how far the results could be correlated with treatments and crop responses. The "total available" P was that extracted by (1), the "acid-soluble" P was (1)-(2), the "adsorbed" P was (2)-(3), and the "flush" P was (3). Interference of F in the extractant with the Mo-blue reaction was considerable in the analysis of soils to which large amounts of P had been applied, but a close correlation was obtained between total available P and the amount applied to the soil.

[49] 631.423.3 : 631.416.2 : 631.411.2
MCGEORGE, W. T. ; PEARSON, G. E. **Field test for available phosphate in calcareous soils.** *J. Amer. Soc. Agron.* 39, 1947 (733-734). [Ariz. Agric. Expt. Sta. Tucson.]

A sparklet syphon with an attachment allowing easy charging by cartridges of liquid CO_2 provides the portable CO_2 -source required for rapid available-phosphate tests in calcareous soils. CO_2 -charged water is added to the 100 ml. mark of a Nessler tube containing 5 gm. of soil. The whole is shaken for 1 minute and filtered into a second tube up to the 50 ml. mark, this filtrate being used for the colorimetric molybdate test.

It is important to observe the above proportions, as they yield a colour gradient analysable with the colour charts of the Purdue and LaMotte test kits.

[50] 631.423.4 : 631.417.747.45
FULLER, W. H. **Decarboxylation rate of uronic groups contained in soil organic matter, plant gums of known constitution and microbial products.** *Soil Sci.* 64, 1947 (183-197).

The evolution of CO_2 from soil organic matter boiled with 12% HCl was greatest in the first 15 minutes after reaching 135°C .

fell abruptly and then decreased gradually. 9-23% of the organic C of the surface soil and 19-30% of that of the subsoil appeared to be uronic. Subsoil uronides showed more rapid decarboxylation when boiling began.

With the polygalacturonide from lemon pectin and glucuronic acid from mesquite gum, peak evolution of CO₂ occurred in the second 15 minutes, also with gum arabic and kelgum in which the initial intensity is much less. With uronic units of natural or pectin-extracted plant materials the rate was similar to that of the plant gums. With increasing decomposition of the plant materials the decarboxylation curve increasingly resembled that for soil organic matter, after 6 months becoming almost identical, and very similar to that for bacterial gums.

The proportion of uronic to organic C was much smaller in natural plant materials than in soil organic matter, but at least half of the plant residues were higher in uronic content after 6 months of microbial decomposition than at the end of 10 or 30 days, the loss in weight of the total sample being after the first few days proportionately greater than the loss of uronic units. It is considered that soil uronides may originate from microbial products.

[51] 63I.423.4 : 63I.417.747.45
FULLER, W. H.; BARTHOLOMEW, W. V.;
NORMAN, A. G. Some factors involved
in the decarboxylation rate of uronic
groups of soil organic matter and
pectin. *Soil Sci.* 64, 1947 (143-156).
[U.S.D.A., Beltsville, Md.]

An investigation of the extent of the interference by non-uronic soil substances on the production of CO₂ during uronic determinations, and of the relative rates of decarboxylation of pure polyuronides and the apparent uronic units of soils, under various conditions of temperature, acid concentration, etc.

Carbonates and soil-absorbed CO₂ increased the CO₂ yield, especially in the first 15 minutes of boiling, and also seriously influenced the shape of the curve representing the rate of decarboxylation of the apparent uronic units. This source of non-uronic CO₂ must be removed by aerating the soil with CO₂-free air for 4 hours in 12% HCl solution, or up to 18 hours if much carbonate is present.

If large amounts of Mn oxides are present, Cl traps must be installed, or a gravimetric procedure used. Various pure hydroxy and mixed phenolic acids yielded barely 0.3% of their total C in uronic determinations.

Variation of the temperature of the reaction and especially of the HCl concentration affected the quantity of CO₂ evolved from both soil organic matter and pectin, and also the intensity of evolution early in the boiling, but did not affect the general shape of the decarboxylation curve, useful in identifying uronic groups from different sources. The addition of reducing agents to the acid caused a uniform decrease, throughout the boiling period, in the CO₂ yield of soil and pectin. The similar response of CO₂-yielding soil organic matter and pure pectin to these varying conditions is further presumptive evidence of the presence of uronic units in soil.

Experiments on the addition of soil to pectin showed no particular influence of the soil constituents on the total CO₂ evolved from the pectin.

It is pointed out that the ratio of apparent uronic C to total organic C of a soil appears practically constant, regardless of rotation and slight differences of clay content.

[52] 63I.423.7 : 63I.414.3.03
RIEHM, H. [Determination of the adsorption capacity of the soil in routine investigations according to H. Riehm, and its significance, especially for the evaluation of the lactate value.] *Ztschr. Pflanz. Düng.* 37, 1946 (61-74). C.A. 41 (6648). [G.]

A rapid method is given for the determination of the S and T-S values. The sum of these two gives the T value, which is expressed in m.e. per 100 gm. of soil. Consideration of the T value instead of the type of soil is admissible only if a relationship exists between the T value and the phosphoric-acid adsorption. Such a relation was established on the basis of data on 210 soils of widely varying origin.

[53] 63I.425
JIMENES SALAS, J. A. La mecanica del suelo, una nueva rama de la edafologia. [Soil mechanics : a new branch of pedology.] *An. Inst. Esp. Edafol.* 5, 1946 (123-149). [Sp.]

A discussion of the advantages of a more general use by soil scientists of the methods and instruments created by soil mechanics.

Subjects discussed include: Burmister's continuous-curve method, as the basis of a simple and complete characterization of the granulometry of a soil; Atterberg's plastic limits of clay and their value in providing quantitative and qualitative information concerning the clay present in a soil; the Enslin value (absorption capacity) of a soil and the use of the edometer in investigating compressibility and permeability of soils.

- [54] 631.425
JIMENEZ SALAS, J. A. La mecanica del suelo, una nueva rama de la edafologia. (2). [Soil mechanics, a new branch of pedology. Part 2.] *An. Inst. Esp. Edafol.* 6, 1947 (167-191). [Sp.]

A review, continued from Part 1, of methods in use in soil mechanics, describing apparatus for determining the shear resistance of soils by direct, triaxial-compression (Hvorslev, Tiedemann), and plastometer methods, and Hvorslev's apparatus for obtaining soil samples in unaltered physical condition.

The volume changes of soils under shearing force, the idea of critical density and Hvorslev's view that the cohesion of a soil is proportional to the maximum pressure suffered by it are discussed, and comments are provided on the results, in graphical form, of an analysis of a deep alluvial clay along the lines suggested in the 2 articles.

- [55] 631.425.22
CHUDNOVSKY, A. F. [A thermal method of determining the moisture of a natural soil.] *Dokl. Akad. S.-Kh. Nauk.* Nos. 9-10, 1946 (38-42). [R.]

The method suggested is based on a direct determination of a new criterion γ , viz. the square root of the product of the thermal conductivity, thermal absorption coefficient and density of the soil. Mathematical manipulations show that the value of γ depends on the volume of the current passing, in the author's apparatus, through an insulated copper wire coiled round a mica plate for a definite period of time (5-10 minutes) from the beginning of the test, and on the initial temperature of the

plate, which is maintained constant throughout the test. The moisture of soil in the field is found from a calibration curve showing $\gamma \times 10^4$ as a function of the moisture content. The moisture- γ curves are compiled for various types of soil experimentally under laboratory conditions.—M.A.O.

- [56] 631.425.22
STOUT, G. J.; HOLBEN, F. J. Simple method for rapid drying of soil moisture samples. *Proc. Amer. Soc. Hort. Sci.* 47, 1946 (238). [Pa. St. Coll.]

A method has been devised for determining the necessity for irrigation, whereby samples are dried in an oven for 2 hours at a temperature of 130°C. with a blast of air to speed up the process.

- [57] 631.425.22 : 581.032.3
GURR, C. G. The freezing point of soil water in relation to the permanent wilting percentage. *Aust. J. Coun. Sci. Indust. Res.* 20, 1947 (105-109). [Waite Inst., Adelaide]

The freezing point method offers a reasonably accurate means of determining the permanent wilting percentage of soils indirectly. Three freezing baths should be used in determining the freezing point of soil water, and heat capacity should be determined for estimation of ice formation. A freezing-point depression of 1.5°C. is a suitable basis for assessing the water content corresponding to the permanent wilting percentage.

- [58] 631.425.5
CHEN, C. T.; HUA, N. The use of the common hydrometer for the mechanical analysis of soils. *Taiwan Agric. Res. Inst. Tech. Bull.* 2, 1947, pp. 18. [Ch.e.]

The right interval before taking the readings was determined by checking with the pipette method, and a depth factor (exactly agreeing with that of Thoreen) for correction of particle size was derived from Stokes' Law and the analytical data obtained. On expressing, in summation curves as proposed by Robinson, the results so far obtained by the pipette, the Bouyoucos hydrometer and the common hydrometer methods, the common hydrometer curves agreed more closely with the pipette curves.

[59] 631.425.5 : 631.414.2.
GERMANOVA, V. N. [A new modification of the Tiulin method of successive separations of elementary soil particles into groups.] *Pedology* 1947 (188-190). C.A. 41 (6648). [R.]

The separation of the particles of group I consists of the following operations: replacement of exchangeable cations with Na; the separation of the particles by decantation, followed by coagulation, drying and weighing. For the separation of group II the following operations are carried out: mechanical and thermal dispersion of soil residue, decantation, coagulation, drying and weighing. The steps of the operations are fully described.

[60] 631.425.6
PALLMANN, H.; FREI, E. Beitrag zur Kenntnis der Lokalklimate einiger kennzeichnender Waldgesellschaften des schweizerischen Nationalparks (Fuorn). [Contribution to the knowledge of the local climates of some characteristic forest associations of the Swiss National Park in Fuorn.] *Ergeb. Wiss. Untersuch. Schweiz. Nationalparks* [1943?] (436-463). [G.] [Agric. Chem. Inst. E.T.H., Zürich]

A method is described of measuring mean temperatures of predominantly unidirectional chemical or biochemical reactions lasting from a few days up to several months. In such reactions, for example humification, or hydrolysis of silicate, the total reaction effect up to any given time is more strongly influenced by the higher than the lower temperatures; the effective mean temperature corresponds not to an arithmetic mean temperature covering the duration of the reaction, but to an exponential mean "eT." The physico-chemical method for determining the eT for any period is based on the fact that the speed of inversion of sucrose at constant pH is a function of the temperature, which may be calculated—given, (by polarimetry), the extent of the sucrose inversion, the pH and the time—with an accuracy limited only by the precision of the polarimetry.

Small colourless glass ampoules, filled with sterile sucrose-buffer solution of a pH chosen according to the length and temperature of the experiment, are placed in the positions whose eT is required.

eT values have proved good characteristics for description of the local climates, including those of the air, ground surface and soil horizons of varied initial and climax forest associations in all seasons, even trivial differences in conduction of heat, heat capacity and soil ventilation being reflected in the eT figures.

[61] 631.427.2 : 631.467.1
MADHOK, M. R.; FAZAL-UD-DIN. A simple method of isolating bacteria-free cultures of protozoa. *Soil Sci.* 64, 1947 (97-99).

Protozoa move much faster than bacteria. The impure protozoan culture is placed into one end of a glass tube of length 20 cm. and diameter 3 mm. which is filled, after sterilization, with sterile dilute culture medium. If the organisms are sluggish at the start, a droplet of starch solution sends them off, and the protozoan in the lead is held in view by microscope. By the 7th cm. all originally adhering bacteria have been left behind and the organism is sealed off, the capture taking from 15-30 minutes.

After 3 days' incubation, the tube, in about 40% of the cases, is full of progeny of the single cell, but attempts to subculture have so far failed.

[62] 631.427.3
TYNER, E. H. The relation of corn yields to leaf nitrogen, phosphorus and potassium content. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (317-323). [W. Va. Agric. Expt. Sta.]

This investigation was concerned with determining the relation of grain yields to varying percentages of N, P and K in the sixth leaf at the bloom stage, and with the establishment of the critical concentrations of these nutrients for maize. The term "critical concentration" refers to the optimum concentration of a nutrient, above which response to further increments is doubtful or occurs at rapidly diminishing rates. A study of the regression trends shows that at nutrient levels in excess of the critical concentration extraneous factors are apt to have a greater influence on yields than nutrient-content variation. Highly significant correlation and regression coefficients were found to exist for the relation of yields to percentages of N, P and K.

631.43 SOIL PHYSICS

(See also Abs. Nos. 112, 115, 129, 187, 218)

- [63] 631.43
BATRA, K. C.; MEHTA, K. M.; PRASAD, V. N. ET AL. **Comparative studies of Indian soils. V. Single value physical constants of Indian soils.** *Indian J. Agric. Sci.* 16, 1946 (258-262). [Imp. Agric. Res. Inst., New Delhi]

No single-value constant was found that could be used instead of mechanical analysis for defining the physical character of a soil, though the sticky point was a more reliable index to field behaviour.

- [64] 631.432.2 : 631.577
NIJHAWAN, S. D.; DHINGRA, L. R. **Distribution of soil moisture under crop and its relation to yield.** *Indian J. Agric. Sci.* 16, 1946 (169-177). [Dry Farming Res. Sta. Rohtak]

The water removed from the soil by two *kharif* crops (bajra and guara) and two *rabi* crops (gram and wheat) was measured by determining the soil's moisture content at different stages of growth. In the early stages of growth the *kharif* crops (sown June-July) get most of their moisture from the rain, the soil moisture remaining more or less constant. After August the crops, especially bajra, draw upon the soil's moisture supply; August rains are necessary to get a normal yield of bajra. With the *rabi* crops there was a large fall in soil-moisture content 20 days after sowing (Sept.-Oct.), followed by a small and gradual fall. At the beginning of March the demand for water increased, and the soil-moisture content fell throughout a depth of at least 6 feet. There was a high correlation between the moisture at time of sowing and the yields of guara and gram, but no such correlation was found for bajra and wheat.

- [65] 631.432.2 : 631.811.91
DOLGOV, S. I. **On the availability of soil moisture to the plant.** *C.R. Acad. Sci. (U.S.S.R.)* 55, 1947 (449-451). [E.] [Dokuchaev Soil Inst.]

Determinations were made of the availability of soil moisture (measured by the rate of transpiration by oat plants under standard conditions) between the field-capacity and wilting-point range of soil

moisture and above the field capacity. The rate of transpiration was greatest independently of the soil, at field capacity ("minimum moisture capacity"), and decreased to a minimum at the wilting point. Above field capacity the rate of transpiration also decreased, possibly owing to reduced aeration of the soil rather than to reduced availability of soil moisture.

- [66] 631.432.3 : 631.58
PILLSBURY, A. F. **Factors influencing infiltration rates into Yolo loam.** *Soil Sci.* 64, 1947 (171-181). [Univ. Calif.]

The soil is a recent alluvium from sedimentary parent rock, and is in a semi-arid area, where soil organic matter is normally low. Its structure, as shown by increases in the rate of water entry, was markedly improved when crop residues applied to the surface were becoming well decayed. The beneficial effects of the organic mulch more than overcame the depressing effect of shade on the infiltration rate. Removing a crop residue or burning it on the soil surface significantly decreased the rate by about equal amounts. Light infrequent hand cultivations temporarily increased the rate, the effect frequently lasting for only one 2-inch irrigation, but the possibly important effect of prior compaction was not tested.

Application of $(\text{NH}_4)_2\text{SO}_4$ and NaNO_3 at 100 lb. of N/acre had little effect on the rate of water entry when concentrations were kept low, but when the water (250 p.p.m. total solids with 40% of total cations as Na) was applied so as to allow some concentration, NaNO_3 caused the greatest reduction in rate. The small effect of the removal of an $\frac{1}{8}$ -inch crust from the soil surface indicated that the influence of organic matter, cultivation and shade extended to greater depth.

- [67] 631.434 : 631.414.324
KOZLOV, V. P. [The anti-erosion stability of soils. 1. The significance of exchange cations in the formation of a water-stable soil structure.] *Pedology* 1947 (418-423). [R.] [Soil Inst., Acad. Sci. U.S.S.R.]

The water stability of naturally and artificially aggregated virgin and cultivated soils saturated with Ca and Na was measured by the volume of dropping water needed to disintegrate the aggregates. Water stability was higher in virgin than in cultivated soils,

and in soils rich in humus and inorganic colloids. An apparent water stability of Na-saturated aggregates was illusory, being caused by their impermeability and the difficulty of getting them thoroughly wetted. This "water stability" has no practical significance. Preliminary capillary moistening increased the rate of disintegration of Ca-saturated large aggregates into micro-aggregates, but retarded further disintegration, whereas it caused the disintegration of Na-saturated aggregates into a formless mass. It is concluded that preliminary capillary saturation is essential if aggregate analysis is to give a correct picture of water stability.

[68] 631.434 : 631.432.3
HUBBELL, D. S. **Effect of soil aggregates on water movement in two calcareous soils.** *J. Amer. Soc. Agron.* 39, 1947 (762-770). [Soil Cons. Serv., U.S.D.A.]

Mixtures of pulverized soils with different percentages of water-stable soil aggregates of known size ranges (0.25-0.59 mm., 0.59-1.19 mm., 1.19-2.00 mm. and 2.00-2.38 mm.) were used in laboratory investigations on the relation of amount and size of soil aggregates and of soil flora to water movement.

The amount and size of the aggregates affected both the capillary rise and percolation. With small aggregates (0.25-0.59 mm.) in quantities not less than 15% of the total weight, capillary rise was steadily increased in both a clay and a sandy loam. In the 0.59-1.19 mm. sets the rate of increase began at the 45% level. In general the capillary rise was more rapid in the sandy loam than in the clay. In the two larger aggregate groups the peak of the capillary rise was observed in the clay at the 75% aggregation point and in the sandy loam at the 60% level. There was a definite retarding effect in the sandy loam above 60% aggregation.

Percolation increased with increase in the percentage of small aggregates, starting with as little as 15% aggregation. Large aggregates up to 2.38 mm. had no effect on percolation until they comprised 60-75% of the total soil weight. Although the larger aggregates were slow to affect percolation the rate was much faster than with the small aggregates. Inoculation of sterilized soil, actinomycetes or bacteria slowed the rate of percolation.

[69] 631.434 : 631.46
STÖCKLI, A. Die biologische Komponente der Vererdung, der Gare und der Nährstoffpufferung. [Biological aspects of humification, tilth and the buffering of plant nutrients.] *Schweiz. Landw. Monatsh.* 24, 1946, pp. 19. [G.]

Includes an outline description of the types, numbers and soil-forming activities of the soil fauna, with particular reference to the work of large insects and larvae, and of soil-eating and -mining organisms, in the fragmentation of lignified organic remains and their mixing with the mineral constituents of the soil, and in the creation of soil porosity. The marked effect of the physical presence and the metabolic products of micro-organisms on the formation of water-stable crumbs was shown by the addition of organic materials to soil, the greatest effects being given by materials with a high percentage of easily decomposable organic matter, green manure being more effective than already partly decomposed farmyard manure, which itself was superior to peat. Crumb formation increased up to at least 7 weeks after addition of organic matter, while stability was greatest after 10 days and then decreased, being, after 60 days, from 20-100% greater than at the beginning. Fungal mycelia were remarkably effective as binding agents. In the presence of sufficient Ca, the CO₂ evolved during decomposition released Ca and P₂O₅ ions, both of which have been shown to favour crumb formation and stability. The extent and nature of fixation and mobilization of N, P, S and C by soil microorganisms is outlined and stressed.

[70] 631.434 : 631.51
CLARKE, G. B.; MARSHALL, T. J. **The influence of cultivation on soil structure and its assessment in soils of variable mechanical composition.** *Aust. J. Coun. Sci. Indust. Res.* 20, 1947 (162-175).

The change in water-stable aggregation, resulting from increased periods of cultivation of grassland, was measured for two types of soil, using a wet-sieving and a suspension procedure. The greatest decrease in aggregation occurred in the first 5 years of cultivation and the total decline ranged from 42 to 69%.

Regression equations relating aggregation and clay content for subsurface samples from the A horizon below the depth of tillage

were used as a basis for extracting the effect of mechanical composition from the aggregation data. Conditions are discussed under which this statistical device can be used for handling data from non-replicated plots where mechanical composition is variable. The use of multiple instead of linear regression equations, involving other fractions as well as clay, is also discussed. The results obtained concerning water-stable aggregation by the wet-sieving and suspension procedures were based on limiting diameters of 0.2 mm. and 0.05 mm. respectively. The two methods gave parallel results for the effects of clay content and cultivation upon aggregation.

Cultivation decreased the N content of the surface layers of both types of soil; it is unlikely that this decrease was the cause of the decline in aggregation resulting from cultivation.

[71] 631.435
MARSHALL, T. J. **Mechanical composition of soil in relation to field descriptions of texture.** *Aust. Counc. Sci. Indust. Res. Bull.* 224, 1947, pp. 20.

A triangular texture diagram has been drawn for the International fraction sizes with limiting diameters of 2 μ , 20 μ and 2 mm., respectively, for clay, silt and sand fractions. It is based on scatter diagrams showing the relationship between mechanical composition and field descriptions of texture made in 1939-1945. From field descriptions the relative amounts of sand and silt affect the apparent clayiness of a sample. Limiting lines for the clay content of the texture classes should slope upwards towards the zero sand line in a triangular diagram, and rearrangement on this basis has brought out a more logical relationship between classes than was apparent on the 1934 diagram established on an International basis.

In a new type of texture diagram the median size of the non-clay fraction is plotted against the clay content. The diagram is divided horizontally into categories of fineness of the non-clay fraction and vertically into categories of clayiness. The diagram is unaffected by the size chosen for dividing the silt and sand fractions, and it allows differences due to the relative amounts of coarse and fine sand to be brought out.

Symbols combining the fineness and clayiness categories that are used to name the classes avoid the confusion between fraction

and texture names and the prejudice involved in the use of such terms as "loam."

Methods are suggested for checking personal factors and for allowing for the effect of physical properties other than mechanical composition. It is concluded that, in Australian field practice, particles between 20 and 50 μ in diameter are considered to be sand rather than silt.

[72] 631.435 : 631.43
CHAKLADER, M. N. **Soils of Bengal and their physico-chemical classification.** *Indian J. Agric. Sci.* 16, 1946 (157-164). [Dept. Agric., Bengal]

Three broad groups of soils are distinguished—(1) red sedentary, (2) red alluvial and (3) new alluvial soils. In each group certain properties could be correlated with clay content of the soil. Heavy clay soils had the highest loss on ignition, water-holding capacity and sticky-point moisture. In the non-lateritic (new-alluvial) soils there was a significant correlation between maximum water-holding capacity and volume expansion.

[73] 631.435 : 631.44
SEN, A. ; UKIL, A. C. ; MUKHERJEE, S. K. ET AL. **Comparative studies on Indian soils. IV. Mechanical analysis of soil profiles.** *Indian J. Agric. Sci.* 16, 1946 (246-257). [Imp. Agric. Res. Inst., New Delhi]

43 soils were grouped into 3 classes according to whether the clay content decreased or increased down the profile, or reached a maximum in the 3rd-4th-foot depth. Most of the soils fell into the last group.

[74] 631.436.6 : 631.415.1
MAKAROV, D. A. **[Temperature optima for hydration.** *Pedology* 1947 (178-182). C.A. 41 (6650). [R.]

The maximum loss of water from soils after freezing takes place when the soils have been frozen at -50°C . With the lowering of the temperature the pH of the soil goes up. Data are given on a chernozem, podzolized soil and forest steppe.

631.44 SOIL TYPES
(See also Abs. Nos. 10, 122, 279, 315)

[75] 631.445.1 : 631.81
BRÜNE, F. **Die Düngung der Moorböden nach neuzeitlichen Grundsätzen.** [The

fertilization of moor soils on modern principles.] *Beitr. Agrarwiss.* 1, 1947(?) (24-37). [G.] [Moor-Versuchssta., Bremen]

A general discussion of the plant-food content of the soils of high, low and intermediate moorlands, and of their manurial requirements for different types of cropping, including details of some standard P and K dressings. The importance of trace elements to moorland farming is stressed. Only high-moor soils from undecomposed young moss peat showed no Cu deficiency. Mn and B deficiency were limited to certain low moors.

[76] 631.445.2 : 631.445.7
KOSTAVA, G. A. [**Peculiarity of the genesis of several podzolic soils of the subtropical zone of western Georgia as a basis for their amelioration through self-induced liming.**] *Pedology* 1947 (152-157). C.A. 41 (6647). [R.]

Analytical data (standard total soil analyses and exchangeable bases) on 3 podzolic soils of river terraces, underlain with calcareous parent material, show that the podzolization process has affected the surface of the soil only slightly. The return of bases to the surface impedes the podzolization process in the subtropics of the Caucasus, and at the same time keeps the soil well limed.

[77] 631.445.53
BENTLEY, C. F. ; ROST, C. O. **A study of some solonetsic soil complexes in Saskatchewan.** *Sci. Agric.* 27, 1947 (293-313). [Dept. Soils, Univ. Saskatchewan and Div. Soils, Univ. Minn.]

The occurrence of solonetsic soils in Saskatchewan and Alberta is closely connected with certain geological formations, predominantly thin glacial drift rather less calcareous than most parent materials in Saskatchewan. The soils have a morphology similar to that of Russian solonetses, but a rather low content (less than 10%) of exchangeable Na and a high content of exchangeable Mg (especially when a clay-pan occurs) in the B₁ horizon.

Two topographic relationships between the member profiles of solonetsic soil complexes have been observed in Saskatchewan. In the commonest, solods are found in the lowest position, with solodized solonets, solonets and normal zonal soil occurring at

progressively higher elevations. In one place the reverse relationship was found; here there was a locally high water table which inhibited leaching in the lowest topographical position.

[78] 631.445.7 : 631.48
RODRIGUES, G. ; HARDY, F. **Soil genesis from a sedimentary clay in Trinidad.** *Soil Sci.* 64, 1947 (127-142). [I.C.T.A. Trinidad]

The kind and degree of weathering and of soil formation from a foraminiferous sedimentary clay or shale of Oligocene age are described. The topography is undulating at about 200 feet and the climate is humid tropical with an annual rainfall of 100 inches and a rainy season of 7 months. The natural vegetation is evergreen seasonal forest and the chief crop is cacao. Downward percolation of water during the rains is mainly through wide cracks developed in the upper 3 feet of soil in dry weather.

The parent rock is mainly kaolinite, illite and quartz with some montmorillonite. Weathering is confined to the top 40 feet and has affected mainly the accessory minerals. The chief weathering processes have been oxidation and hydration. Podzolization is the chief soil-forming process. CaCO₃ has been removed completely from the upper 25 feet, presumably by continued leaching by carbonated ground water. Most of the leached carbonate has been precipitated at 30-35 feet where the transition between the yellow-mottled clay and the uniformly dark grey parent rock begins. P and gypsum and to some extent K have been leached downwards and there is a distinct accumulation at 10-15 feet of calcium phosphate, much of which is soluble in dilute acid and available to plants. CaSO₄ has accumulated in the 30-40 feet layer. There has been no profound leaching or segregation of Fe oxides except for some slight accumulation of limonite at 20-25 feet, and in the transition layer between soil parent material and parent rock.

[79] 631.445.73
PENDLETON, R. L. **The laterite soils of Siam.** *Ann. Assoc. Amer. Geog.* 37, 1947 (50-51).

Laterite is an illuvial horizon, high in iron oxides, with a slaglike, cellular or pisolitic

structure and of such hardness that it can be quarried and used for building. A laterite soil is one in which a laterite horizon is found. In Siam the laterite develops under two sets of conditions: (1) in a peneplain or stable alluvial plain where the zone of annual oscillation of the water table is relatively fixed over a long period of time and is sufficiently close to the surface that ferrous compounds in the soil-water are oxidized to ferric compounds and thus immobilized; (2) in the soil or on the surface of lower slopes of hills where ferrous compounds in the seepage water are oxidized to laterite. While vesicular laterite tends to develop in a clayey matrix and pisolitic laterite in a sandy one, the character of the parent materials is of secondary importance.

63I.458/9 SOIL EXHAUSTION AND EROSION

(See also Abs. Nos. 339, 361)

[80] 63I.458 : 546.226
MADER, E. O. A corrective measure for "soil sickness" occurring in sand media. *Phytopath.* 37, 1947 (682-683). [Univ. Farm, St. Paul, Minn.]

Detrimental effects on plants from causes other than cultural practices, fertilizers, fungi, bacteria or viruses may be due to "soil-sickness." Crops show gradual decline in productivity until they can no longer be grown on the same soil. Soil sterilization with heat, formaldehyde or chloropicrin has not corrected the condition. 1% concentration of H_2SO_4 applied at 5 gallons per 20 square feet to sand 4 inches deep corrected the "sickness." After treatment the sand was flooded with water to remove H_2SO_4 that might affect the crops. Using this method, frequent changes of soil, sand or gravel in greenhouses is unnecessary.

[81] 63I.459
MUSGRAVE, G. W. The quantitative evaluation of factors in water erosion—a first approximation. *J. Soil Water Conserv.* 2, 1947 (133-138).

The primary factors influencing the rate of erosion are known to be (a) rainfall, (b) flow characteristics of surface run-off as affected particularly by slope degree and length, (c) soil characteristics (d.) vegetation

cover. All data bearing on these factors were analysed, and the most probable relationships developed. As a first approximation, the relations of rainfall, degree and length of slope were severally expressed in the form of equations. Data on the relation of vegetable cover to erosion were analysed and the results shown in a table of the relative erosion for different covers. Tabulated data also show the relation of soil characteristics to erosion. Soil losses on different soils at the erosion experiment stations are shown, with adjustments for rainfall, and degree and length of slope.

[82] 63I.459 : 63I.43
ELLISON, W. D.; ELLISON, O. T. Soil erosion studies—Part VII. Soil transportation by surface flow. *Agric. Engng.* 48, 1947 (442-444, 450).

In the early stages of erosion, when runoff moves as a broad sheet of water across a field (the "prechannel" stage), the soil-suspending capacity of the water is quite low, but the impact of raindrops will cause sufficient turbulence greatly to increase this capacity, and consequently erosion. Splashing raindrops may also greatly increase the transporting capacity of shallow channelized flow. If the surface soil is fully protected against the impact of raindrops very little soil will be transported except that moved by channelized flow. The "transportability" is an important characteristic of a soil, and several hypotheses are advanced to elucidate its relationship to other factors such as length and degree of slope, degree of aggregation, soil texture, velocity of surface flow, etc.

[83] 63I.459 : 63I.47
UNITED STATES DEPARTMENT OF AGRICULTURE. A conservation farm plan. U.S.D.A. *Soil Conserv. Serv.* 1947, pp. 8.

An example of a conservation farm plan prepared with the assistance of soil-conservation service technicians in a soil-conservation district, and a summary of the results of conservation applied on the farm.

[84] 63I.459 : 63I.61
WOOLEY, J. C.; CLARK, W. M.; BEASLEY, R. P. The Missouri soil saving dam. Low-cost structure for use in farm plans for water management. *Missouri Agric. Expt. Sta. Bull.* 499, 1946, pp. 23.

A concrete soil saving dam for control of gullies and sheet washing on farms is described.

[85] 631.459:633.285
DU TOIT, R. **The common reed for soil-erosion control.** *Farm. S. Africa* 22, 1947 (753-757).

Phragmites communis is used in the Vlekpoort valley to hold silt caught up by concrete weirs built in erosion gullies. The stem is self propagating by means of aerial and subterranean runners and penetrates up stream in water and silt. It is palatable grazing for cattle.

631.46 SOIL MICROBIOLOGY

(See also Abs. Nos. 61, 69, 319)

[86] 631.46
THOM, C. Control de la poblacion microbiana del suelo. [Control of the microbiological soil population.] *An. Inst. Esp. Edafol.* 6, 1947 (193-200). [Sp.]

A lecture in general terms emphasizing that soil micro-organisms are an important capital asset, and recalling R. B. Mitchell's control of *Phymatotrichum* (causing cotton root rot) by addition of sufficient organic matter to all infested soil levels, in order greatly to increase the microbiological activity of the soil, at the moment when host tissues are scarce in it.

[87] 631.461
DUCHÉ, J. Les associations de micro-organismes dans les sols. [Associations of micro-organisms in soils.] *C.R.* 225, 1947 (891-893). [F.]

Investigations on micromycetes have been carried out on two calcareous dolomitic soils, one with a sparse plant cover, and the other forested, and also on an infertile calcareous soil similar to the first in sparseness of cover and in physico-chemical constitution. Three micromycete associations which are characteristic of these soils have been determined from samples taken from positions up to 7 km. apart, and from samples taken at an interval of 1 year. To overcome the difficulty that results obtained from pure cultures *in vitro* are unrepresentative of conditions in the heterogeneous micro-population of the soil, a method was

used (details not provided) in which the number of analyses was multiplied, and each analysis caused a disturbance of not more than 5% on the list of organisms isolated.

The determination of these associations, since they are influenced by trace elements, should make available more precise information than the usual analyses do on the chemical composition of the soil.

[88] 631.461.1/3:547.458.84
MASSACHUSETTS AGRICULTURAL EXPERIMENT STATION. **Investigation of agricultural waste products—lignin.** *Mass. Agric. Expt. Sta. Bull.* 428, 1945, pp. 25. Biol. Abs. 21 (1492).

Pure lignin was added to finely ground samples of silage, timothy hay, cornstalks and oat hay, thoroughly mixed, inoculated with a soil suspension and allowed to incubate at about 32°C. for several months. The lignin contained 64.2% of C and 5.6% of H and was added in amounts equivalent to about 14% of the plant material. Added N was supplied in the form of 1 gm. of ammonium carbonate to each 100 gm. of the organic material, and total ammoniacal N, solids and the pH value were determined at intervals. Tentative results indicated that there was a greater loss of organic matter from the cornstalks and oat hay in the presence of added lignin; timothy hay and silage decomposed at about the same rate with or without lignin. In general, ammonification was retarded in the presence of lignin. Added lignin did not appear to alter materially the rate of aerobic decomposition of plant substances when sufficient N was available.

[89] 631.461.1/3:547.458.84
BENNETT, E. **The decomposition of certain plant tissues with and without added lignin.** *Proc. Amer. Soc. Hort. Sci.* 47, 1946 (252-254). [Mass. Agric. Expt. Sta.]

The presence of added lignin did not retard significantly the decomposition of silage and timothy hay and actually accelerated that of corn stalks and oat hay, especially the latter. This does not imply that lignin is an accelerator for the decomposition of plant tissue, but that its presence under certain conditions is not inhibiting.

[90] 631.461.1/3:547.458.84
LINDBERG, G. **On the decomposition of lignin and cellulose in litter caused by**

soil-inhabiting Hymenomycetes. *Ark. Bot.* 35A, No. 10, 1947 (1-16). For. Abs. 9 (15).

Most species attack lignin and cellulose to about an equal extent; a few attack lignin especially strongly but cellulose only to a slight extent.

[91] 631.461.1/3 : 576.809.7
JACOBS, S. E.; MARSDEN, A. W. The role of antibiotics in the decomposition of sawdust. I. Inhibition of the growth of cellulose-decomposing bacteria. *Ann. Appl. Biol.* 34, 1947 (276-285). [Imp. Coll. Sci. Tech., London]

Sawdust contains substances that inhibit the growth of cellulose-decomposing bacteria of the genera *Sporocytophaga* and *Cellulomonas*, the former being the more sensitive. It is possible that the specific antibiotics are more active under acid than under alkaline conditions. *Sporocytophaga* will probably never be of practical use for decomposing sawdust, but the addition of chalk would probably suffice to reduce antibacterial activity to a level low enough to permit the development of *Cellulomonas*.

[92] 631.461.2 : 535.21
CULTRERA, R. [Arable soil in relation to the photochemical oxidation-reduction reactions of the NH_4^+ and NO_3^- ions. II.] *Ann. Chim. Appl.* 37, 1947 (81-87). C.A. 41 (6473).

When NH_4^+ and NO_3^- ions, in contact with the soil, are irradiated by means of a Hg arc light, the NH_4^+ is oxidized to NO_2^- while the NO_3^- is reduced to NO_2^- , even when the soil has been sterilized by heating for 30 minutes at 140° . The reactions are photochemical and are probably duplicated in nature by the action of the sun.

[93] 631.461.5
QUASTEL, J. H. The metabolism of nitrogen in soil. *Endeavour* 6, 1947 (129-134).

An account of present-day ideas on the fixation of atmospheric nitrogen, *Rhizobia*, non-symbiotic nitrogen fixation, ammonia formation, nitrification and the liberation of free nitrogen.

[94] 631.461.51 : 541.128
FEDOROV, M. V. [The chemistry of atmospheric nitrogen fixation by *Azoto-*

bacter. 2. The chemical nature of the catalyst and the mechanism of fixation of atmospheric nitrogen.] *Dokl. Akad. S.-Kh. Nauk.* Nos. 5-6, 1946 (28-37). [R.] [Timiriazev Acad., Moscow]

Evidence had previously been obtained of the existence of a catalyst of N fixation on the surface of the protoplasm of *Azotobacter*. Its chemical structure was investigated by introducing into the culture media substances neutralizing one of the assumed component groups, and determining whether the neutralization had any effect on the activity of the catalyst. The hypothetical catalyst was found to contain carboxyl, amino and carbonyl groups, being presumably of proteid nature. The carbonyl group only was found to participate directly in N fixation. In presence of even minute quantities of substances such as anilines, phenylhydrazines or hydroxylamines which react with carbonyl groups, N fixation was stopped, while a minute quantity of acetaldehyde in the media invigorated the process. Molecular N appeared to react with the catalyst through the carbonyl group, producing hydrazine derivatives as the primary products. The reaction was initially endothermic, but ultimately became exothermic. The hydrazine derivatives could subsequently be converted into amino acids, by interaction of the N with a ketonic group in the α -position; in that case the catalyst would change into protein. Alternatively the primary products may be changed by reduction or hydrolysis into mineral N compounds. N fixation by the carbonyl group of the catalyst would thus provide *Azotobacter* with the N required for synthesis of proteid compounds and with the energy required for sustaining vitality.—M.A.O.

[95] 631.461.51 : 577.17 : 577.16
DUNEZ, A. Résultats culturaux obtenus par l'utilisation de cultures hétéro-auxinées et vitaminées de fixateurs d'azote. [Results obtained from the use of hetero-auxinized and vitaminized cultures of nitrogen-fixing micro-organisms.] *C.R. Acad. Agric.* 33, 1947 (548-549). [F.]

The addition of yeast autolysate (containing vitamins B_1 and B_2) to the seed dressing composed of a hetero-auxinized culture of N-fixing micro-organisms permits yield-increases of 25-30% in cereal and other crops

over controls grown from untreated seed. The cultures stimulate cell multiplication and favour the multiplication of N-fixing bacteria in the rhizosphere.

[96] 631.461.52 : 547.963.4
KEILIN, D.; SMITH, J. D. **Haemoglobin and nitrogen fixation in the root nodules of leguminous plants.** *Nature*, 159, 1947 (692-694). [Moltano Inst., Univ. Cambridge]

Within the root nodules of leguminous plants haemoglobin displays its usual property of oxygenation. On spectrographic examination the nodules show only the mixture of haemoglobin and oxyhaemoglobin, and no methaemoglobin was detected in nodules even if the plants were kept in the dark for several days. No evidence was found to support the view that N fixation involves a cyclical change of the valency of haemoglobin Fe. There seems little doubt that the activity of haemoglobin is linked with the process of symbiotic N fixation and this will have to be considered in further studies of N fixation by leguminous plants.

[97] 631.461.52 : 547.963.4
VIRTANEN, A. I. **The biology and chemistry of nitrogen fixation by legume bacteria.** *Biol. Rev.* 22, 1947 (239-269). [Biochem. Inst., Helsinki]

There is a distinct parallelism between N fixation and the occurrence in nodules of leghaemoglobin which is the red pigment contained in effective root nodules. If the pigment is not present in the nodule or if it is decomposed, N fixation does not occur.

[98] 631.461.52 : 631.416.1
TOMPOS, A. **Nitrogényűjtő növények és a talaj nitrogén-tartalma. [Nitrogen-fixing plants and the nitrogen content of the soil.]** *Kizér. Közlem.* 47-49, 1947 (31-32). [H.e.r.]

The crop following legumes was found to require N fertilizer in 94% of the cases after lucerne, 78% after clover, and 84% after peas.

[99] 631.461.52 : 631.84
CHAPMAN, H. D.; LIEBIG, G. F., JR. **Nitrogen gains and losses in the growth of legume and nonlegume cover crops at various levels of nitrogen fertilization.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (388). [Univ. Calif. Citrus Expt. Sta., Riverside]

Addition of N fertilizer caused a decrease in the gain of N by fixation with a crop of purple vetch and *Melilotus indica*. It appears that, given plenty of available N and decomposable organic matter, N is lost, probably through decomposition and gaseous loss to the atmosphere.

[100] 631.462
GIRAUD, E. **La stérilisation du terreau des couches a semis. [The sterilization of seed-bed earth.]** *Potasse* 146, 1947 (129, 130). [F.]

A method giving excellent results with tobacco beds in Bergerac, by which a cubic metre can be sterilized in 4-5 hours, is to place the soil, to a depth of 10 cm., on a corrugated iron sheet resting over a trench containing a wood fire, the whole being open at one end for stoking and roughly fitted with a stove-pipe chimney at the other.

The soil is watered copiously and turned with a shovel as soon as steam appears. The turning is repeated twice, and sterilization is complete within 15 minutes, the soil being heated only until it is just too hot to hold. It is then carried, spread to a depth of 10 cm., crumbled by spading, raked, lightly compressed, soaked with water and allowed to dry. Treated soils dry more easily than untreated, and need more watering.

[101] 631.466.2 : 576.809.7
MEREDITH, C. H.; SEMENIUK, G. **Report 1945-1946, Part I.** *Iowa Agric. Expt. Sta., Rept.* 1946 (166-202). R.A.M. 26 (380).

21% of actinomycetes isolated from Iowa soils were antagonistic towards *Pythium graminicola*. Maize plants grown with *P. graminicola* in soil treated with crude solution of *Streptomyces* were taller and had longer roots than those in untreated soil. Plants grown without *P. graminicola* were improved by the addition of the crude solution.

On agar plates *P. graminicola* grew well in the absence of the crude solution but showed no growth in its presence. The active principle is less toxic to *P. graminicola* than mercuric chloride, but is as toxic as CuSO_4 ; a concentration of 1% of crude solution in the medium or 1 part of its dried residue in 100,000 parts of medium inhibits growth.

[102] 631.466.2 : 576.809.7
 EHRLICH, J. ; BARTZ, Q. R. ; SMITH, R. M.,
 ET AL. **Chloromycetin, a new antibiotic
 from a soil actinomycete.** *Science* 106,
 1947 (417).

A *Streptomyces* species isolated from a soil sample collected in a mulched field was found to produce chloromycetin, the crystalline form of which showed *in vitro* activity against several bacteria.

[103] 631.466.2 : 631.461.51
 NICKELL, L. G. ; BURKHOLDER, P. R.
**Inhibition of azotobacter by soil actino-
 mycetes.** *J. Amer. Soc. Agron.* 39, 1947
 (771-779). [Osborn Bot. Lab. Yale Univ.,
 New Haven, Conn.]

The inhibition of *Azotobacter vinelandii* was studied by inoculating actinomycete cultures grown in artificial media and in soils and cover-crop materials with *Azotobacter*. Antibacterial activity was present in 25 different actinomycete cultures. The *Azotobacter* were either greatly reduced in number or completely killed by actinomycete cultures during incubation together in the various mixtures. It is stressed that the data emphasise the importance of microbial antagonism in theoretical ecology as well as in practical agriculture.

[104] 631.466.3 : 631.461.5
 FOGG, G. E. **Nitrogen fixation by blue-
 green algae.** *Endeavour* 6, 1947 (172-175).

Some species of blue-green algae are able to fix N under well-defined conditions. Assimilation of free N does not occur if readily available combined N is present, and fixation does not start until ammonium salts or nitrates have been exhausted from the soil. Traces of Mo are necessary for fixation. A slightly alkaline medium is most favourable and fixation does not take place with pH below 5.7. Blue-green algae are fairly abundant in some tropical surface soils and are important in maintaining fertility, especially in ricefields in India.

[105] 631.467.1
 SINGH, B. N. **Studies on soil Acrasieae.
 2. The active life of species of *Dictyo-
 stelium* in soil and the influence thereon
 of soil moisture and bacterial food.**
J. Gen. Microbiol. 1, 1947 (361-367). [Rotham-
 sted]

When spores of *Dictyostelium mucoroides* or *D. giganteum* were added to sterilized soil containing a pure culture of an edible bacterium, the resulting myxamoebae actively destroyed the bacteria in the soil. No fruiting bodies were found at a moisture content of 15% or less, but at 33% moisture, fruiting bodies covered the whole soil surface. Species of *Dictyostelium* can pass through the life cycle in fresh unsterilized soil.

[106] 631.468
 FENTON, G. R. **The soil fauna : with
 special reference to the ecosystem of
 forest soil.** *J. Anim. Ecol.* 16, 1947 (76-93).

Soil fauna is divided into 3 size classes called micro-, meso- and macro-fauna, and the methods used in sampling the whole soil fauna are outlined. Soil animals are grouped according to their food habits and effects on the soil. The importance of humus and its distribution in the soil and the role of the meso-fauna in effecting this distribution are described. It is suggested that one of the primary factors determining the distribution of the meso-fauna is the palatability of the leaves, which is closely related to their Ca content. The factors at play in the formation of mull and podzol are described. The part played by animals in the N cycle and by their action in speeding up and possibly determining the course of decay is outlined. The assimilation of N by the plant is mentioned with particular reference to the mycorrhizal habit of trees.—from Author's summary.

[107] 631.468
 STRICKLAND, A. H. **The soil fauna of
 two contrasted plots of land in Trinidad,
 British West Indies.** *J. Anim. Ecol.* 16,
 1947 (1-10).

Between November 1943 and March 1944 soil samples were taken at fortnightly intervals on two plots of the same soil, one under mature cacao and the other under exposed conditions of open savanna land. In both plots there was a tendency for the soil fauna living in the surface layer to migrate downwards during the dry season. The populations of the two plots differed markedly in composition and the cacao plot had a richer fauna probably because of the surface litter.

[108] 631.468 : 634.9
 MELICHAR, J. **Několik slov o edafonu
 lesnich pud.** [Notes on the edaphon of

forest soils.] *Lesnická Práce* 26, 1947 (15-22). *Biol. Abs.* 21 (1506).

A summary of counts of arthropods, Acarina and Vermes in forest soils.

631.47 SURVEYS

(See also Abs. No. 83)

[109] 631.47:33
MYSÁK, S. The significance of economic land use surveys in conservation programs. *Sci. Agric.* 27, 1947 (457-465).

631.48 SOIL FORMATION

(See also Abs. Nos. 69, 78)

[110] 631.48
ALBAREDA HERRERA, J. M. La formación del suelo en climas húmedos. [Soil formation in humid climates.] *Estud. Geog.* 5, 1944 (347-362). [Sp.]

An outline description of the characteristics of podzols, grey soils and rendzinas, and of the factors concerned in their formation.

[111] 631.483:552.333.4
BEATER, B. E. Chemical composition of some Natal coastal dolerites and their alteration products. *Soil Sci.* 64, 1947 (85-96). [S. African Sug. Assoc. Expt. Sta., Mount Edgecombe, Natal]

The occurrence and complex igneous nature of dolerite rock, the climate of the Natal coast and the formation and profiles of doleritic soils are briefly treated.

Weathering of 2 distinct types, determined less by climate than by local ground-water conditions, occurs in dolerites of similar composition in the same localities. Type-A weathering—usually in very damp ground—produces a spongy ochreous crust to the weathering stone, and type B—found particularly where ground water is less plentiful—produces grey concentrated layers which can be successively removed by hand.

Chemical analyses of unweathered core, weathering crust and immediately surrounding soil, representing both types of weathering show in type-A weathering a great loss of SiO_2 , alkaline earths and Na_2O , and in type B only a small loss of these materials. The final process of soil formation is likewise

different, an active secondary resilication occurring above dolerite of type-A weathering, the derived soils containing nearly 3 times the silica possessed by the weathering crust.

631.5 CULTURAL OPERATIONS

(See also Abs. Nos. 70, 206, 213, 263)

[112] 631.51:631.43
COSTA, J. V. B. DA; ALVES, J. DE A. Condições físicas das terras da Gafanha. Modificações determinadas pela cultura. [Physical condition of the soils of Gafanha. Modifications determined by cultivation.] *An. Inst. Sup. Agron. Lisboa* 13, 1942 (121-135). [Pt.e.]

Increases in organic matter and plant nutrients in the cultivated sands of Gafanha, reclaimed through the use of seaweed, are significantly lower than those in other areas reclaimed with seaweed + large dressings of farmyard manure and with town refuse. Data concerning the physical condition of sands that have never been cultivated and of those cultivated for 7, 10, 25, 50 and 100 years show a steady increase in silt, clay and humus with cultivation. Although small, these increases affect significantly the position of the pF curve, but its shape changes only after about 100 years of cultivation. Up to that time, although the moisture-holding capacity increases, the available capacity is almost unaffected. Although the rate of capillary rise is small the increase in percentage of finer fractions and in the amount of humus are sufficient to improve the moisture conditions in the soil, which explains the increase of productivity with time.

[113] 631.512
MILLAR, C. E.; WEIDEMANN, A. G. Tests with depths of plowing. *Mich. Agric. Expt. Sta. Quart. Bull.* 30, 1947 (5-12).

A review is made of literature on deep tillage. In a 14-year experiment on the effect of different depths of ploughing sandy loam, the highest yields of clover hay, maize grain and maize stover were obtained from 4-inch ploughing, the next highest from 7-inch and the lowest from 10-inch. For grain and straw of wheat and barley the reverse was true. Although the subsoil was

not heavy, as the experiment progressed and the subsoil became more thoroughly mixed with the surface soil on the 10-inch ploughed plots, there was a growing tendency for the soil to crust over on drying after rain. This crusting did not affect wheat and barley, but interfered with the emergence of maize plants. Great care, low speed and a narrow furrow were necessary for properly turning the 4-inch furrow slice, and ploughing to the usual depth of 7 inches is considered the most economical practice on this soil.

[114] 631.544.7
TURK, L. M. ; PARTRIDGE, N. L. **Effect of various mulching materials on orchard soils.** *Soil Sci.* 64, 1947 (111-125). [Mich. Agric. Expt. Sta.]

Results of a 4-year lysimeter study. Moisture is probably the greatest limiting factor in Michigan fruit production. Straw and alfalfa mulches were equally effective on each of three soils in decreasing evaporation losses. Mulching materials such as straw, alfalfa, gravel, shavings and to a lesser degree sawdust were of almost equal value and effectiveness in conserving moisture. By decreasing runoff, increasing intake and reducing evaporation, mulches may induce deeper storage of water in the soil. Peat was of doubtful value as a mulching material. Its high absorptive capacity for water prevented much water from reaching the soil during light rains, evaporation from the mulch being sufficient to offset any beneficial effect in decreasing evaporation of water from the soil below. Peat also encouraged weed growth. Nitrification was slower under mulches. A definite increase occurred in the total quantity of exchangeable bases in all soils where alfalfa was used and a very definite decrease occurred in all instances where ammonium sulphate was added to the straw and maize-stover mulches.

[115] 631.544.7 : 631.434
PEELE, T. C. ; NUTT, G. B. ; BEALE, O. W. **Utilization of plant residues as mulches in the production of corn and oats.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (356-360). [S.C. Agric. Expt. Sta.]

Maintaining crop residues on the surface of the soil was much more effective in reducing runoff and erosion from areas

where maize or small grains were growing than ploughing-under the residues and using conventional clean tillage practices. The mulch methods caused greater improvement in soil aggregation and a more rapid increase in soil organic matter and N in the top 5-inch layer than ploughing-under cover crops followed by clean tillage practices.

[116] 631.547.2 : 539.16
FEHÉR, D. Untersuchungen über die biologische Wirkung der kurzwelligen Strahlung der Elemente. II-V. Untersuchungen über die biologische Wirkung der durchdringenden Strahlung der Elemente. VI-VII. [Investigation on the biological effect of short-wave radiation of elements. II-V. Investigation on the biological effect of penetrating radiation of elements. VI-VII.] *Erdész. Kisérl.* 45, 1945 (341-360, 362-369). *Biol. Abs.* 21 (1509). [Univ. Sopron, Hungary]

It is shown that 72 of the known chemical elements and their compounds develop a biologically effective, penetrating radiation. The radiation, which probably consists of particularly penetrating quanta, causes tropic movements of the plants and stimulates their growth and flowering. Presumably, the quanta penetrate the soil and reach the plant roots and also incite a progressive secondary radiation of the soil particles which in turn produces a further physiological effect.

[117] 631.557 : 551.577
HALLGREN, G. **Studies on the influence of precipitation on crop yields in Sweden with special reference to field irrigation.** *LantbrHögsk. Ann.* 14, 1947 (173-289). [E.] *Appendix*, 1947, Tables XXVII.

The results of investigations, on 9 state farms over about 40 years, of the relationship between precipitation and yields of cereal, root and grassland crops, to determine which crops and areas might benefit from irrigation. Earlier methods based on a linear relationship between precipitation and yields were unsatisfactory, and the present studies cover the multiple relationship between precipitation, temperature and yields, corrections being applied for the marked secular trend in yields.

For spring-seeded grains, the May and June precipitation was the most essential

factor; that of July and August seldom influenced the yield markedly. With potatoes, the calculated (technical, not economic) optimum precipitation was close to the average for the different localities, as it was also for root crops, for which on the farms in South Sweden the May-June precipitation was the essential factor, and the July-August of little importance, although on other farms the opposite result was obtained. Leys were markedly dependent on May-June precipitation, the optimum in Middle Sweden being 130-140 mm., representing an average deficit of 50-60 mm., while for Gotland the the average precipitation would need to be doubled for optimum production. The precipitation during the last 30 days before harvest had the greatest influence on the yield.

With autumn-seeded grains, January-April temperatures were the vital factor: variations in precipitation had less effect than on the other crops investigated, and irrigation could not repay itself.

The relationship between sprinkler irrigation and precipitation was determined, the effect of irrigation appearing to be 40-50% of that of precipitation. Thus the leys would need about 110 mm. of irrigation water in May-June in the conditions of Middle Sweden to obtain the technical optimum yield, barley about 50 mm. and oats 60 mm., these calculated optima shifting with temperature.

[118] 631.58 : 631.312.5
DULEY, F. L.; MATHEWS, O. R. **Ways to till the soil.** *U.S.D.A. Yrbk.* 1943-1947, 1947 (518-526).

A survey of stubble-mulch farming methods.

[119] 631.582 : 631.67
NELSON, C. E.; LARSON, C. A. **Crop rotations under irrigation at the Irrigation Branch Experiment Station, near Prosser, Washington.** *Wash. Agric. Expt. Sta. Bull.* 481, 1946, pp. 30.

On a fine sandy loam, crops were grown annually and in 2-, 4-, 5- and 7-year rotations with and without manure. On the 4-, 5- and 7-year rotations, 65 lb./acre of P_2O_5 was applied to the legume crop. Where lucerne was grown on the same plots annually, the

plot receiving manure gave a higher yield than the plot without manure. Maize was grown satisfactorily on the same plot annually with 12 tons/acre of manure each year, but the yield was lower than in the 5- or 7-year rotation in which lucerne was grown. Wheat and potatoes were unsatisfactory when grown on the same plots annually with 12 tons of manure each year. The wireworm population in wheat was high in the 2-year rotations. Sugar beet was satisfactorily grown on the same plots annually with 12 tons/acre of manure each year, but nematodes damaged the crop. The 5-year rotations produced similar potato yields to the 7-year rotations, but higher maize and wheat yields; wireworm populations were higher in 5-year rotation plots than in the 7-year plots. In the 7-year rotations, potatoes were satisfactory only after lucerne. Sugar beet was satisfactory after lucerne or one year removed from lucerne after potatoes. Sugar-beet yields were low after maize.

[120] 631.584
KURTZ, T.; APPLEMAN, M. D.; BRAY, R. H. **Preliminary trials with intercropping corn and clover.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (349-355). [Ill. Agric. Expt. Sta.]

A system of intercropping maize and clover, known as slit cropping, is described. In this system red clover and sweet clover were turned under only in narrow strips where maize rows were to be placed, and the clover between the rows was clipped close to the ground when the maize was planted. The sweet clover was killed by this clipping and remained as a mulch on the unploughed strips between the rows. A modification with oats as the intercrop was also included. The slit-crop plots were paired with adjacent plots which were spaded and cultivated to simulate the conventional seedbed preparation and management. Although there were smaller yields with the slit cropping it is pointed out that the advantages of this system may be great enough to warrant its use particularly where erosion control and soil conservation are primary considerations. The possibility of reducing the ploughing and cultivation which is at present needed for maize cultivation is alone considered sufficient to warrant further trials with the slit-cropping system.

[121] 631.584 : 633.2/3 : 535.21
ROBERTS, R. H. **Effect of temperature and photo-period upon growth of grasses planted with legumes.** *J. Amer. Soc. Agron.* 38, 1946 (947-963). [Univ. Wisc., Madison]

Mixed cropping with legumes causes grasses to grow more rapidly, provided the days are long, and temperatures—at least at night—relatively low, i.e., under conditions existing in northerly localities. Successful combinations were: barley or oats with peas; fescue, white clover; winter rye, winter vetch; timothy, red clover; smooth brome grass, lucerne.

[122] 631.589 : 631.452
RENARD, P. J. J. **Quelques considérations sur la régénération des sols de savane. [The regeneration of soils in savanna areas.]** *Bull. Agric. Congo Belge* 38, 1947 (626-634). [F.a.]

An improvement on the native bush fallow is described, in which on clearing wooded savanna for cultivation, most of the tree stumps are left alive and standing ungashed to 40 cm. During the growth of cotton, which is the first crop and intolerant of shade, all new shoots are removed from the stumps until the end of the rains, when 2 or 3 per stump are allowed to grow. Next summer the shoots are thinned to allow more light and air to the food crops now growing. After the manioc harvest, which ends the rotation, the land is left to the bush fallow which this method much expedites. Evaporation, insolation and erosion are moderated during the cultivation periods, and crop growth is not disturbed. The initial clearing necessitates burning, which does not harm buried seeds or the cambium of trees, provided they are dry when burnt, and which destroys harmful insects. The half-burned branches are left on the ground, brought between the rows at seeding and left to decay.

A method of providing a denser plant cover for the bush fallow of comparatively untreed savanna is to gather several kg. of seeds of named forest species during ripening (December-January in N. Congo), sow them in pockets of 5 or 6 at random at the groundnut sowing, and spare them at all subsequent weeding.

Bush burning is inimical to these methods of regeneration. It is pointed out that 6 rows, 2 m. apart, of *Cassia Siamea* form a good firebreak.

631.6 RECLAMATION. DRAINAGE. IRRIGATION

(See also Abs. Nos. 18, 20, 66, 119, 328)

[123] 631.614
WATERER, R. R. **The state forests : their role in the island's land use policy.** *Proceedings of a Conference on Land Use in a Mediterranean Environment, April 1946. Nicosia 1947 (10-13).*

In reclamation work on fired and wasted-out forest areas in Cyprus, all grazing should be stopped. Hillsides should be terraced, starting at the top and working downhill. It is then usual for forest-tree seeds, preferably *Pinus halepensis*, to be broadcast on the contour steps and down the banks, and raked in during the winter rains.

[124] 631.615
KIRKWOOD, J. **Reclamation of cut-over woodland at Auchincruive.** *Scot. Agric.* 26, 1947 (208-211).

An estate which had carried oak, beech and chestnut felled in 1926-1928 had become overgrown and useless for grazing. In 1940 most of the area was gyrotilled twice, the second time to a depth of 15 inches. It was then harrowed, tile drains were put in where the subsoil is clay, and the area sown to grass. 2 tons/acre of CaCO_3 was required and P and K fertilizers were also added. On one area of 4 acres potatoes were planted and a crop of 5 tons/acre taken 5 months after cleaning was begun.

[125] 631.616
BAEYENS, J. ; SCHEYS, G. ; GHESQUIÈRE, A. **Studies op de in 1944 overstroomde poldergronden in België, 3^e mededeeling: De veldproeven in 1946. [Studies in the inundation of polderlands in Belgium, 3rd report: Vegetation tests in 1946.]** *Agricoltura, Bijz. Nr.*, April 1947, pp. 64. [F.l.e.f.g.]

27 experimental fields have been established in Western Flanders in 3 different areas, (1) badly inundated but improving quickly, (2) heavy polder land of poor structure, (3) land drained only in 1946. Plots that had received N fertilizer were of much better structure than those with no N, and it is believed that there is an indirect connexion between N fertilizing and improve-

ment in structure, apart from the production of better crops with better rooting systems on the N-fertilized plots.

Gypsum and CaCl_2 made the soil crumbly. Slaked lime had a less clear effect and CaCO_3 had no effect on soil structure. From laboratory analyses it is believed that P and carbonate contents of the soil decrease after the water has withdrawn. The structure of the soil improves slowly as CaCO_3 changes to the more soluble $\text{Ca}(\text{HCO}_3)_2$.

[126] 631.62
CENTRAL STATES FOREST EXPERIMENT STATION. **The effects of levelling on spoil-bank material.** *Cent. St. Forest Expt. Sta. Rept. 1945, 1946 (10-11).* For. Abs. 9 (54).

The use of surface-mined land for cropping raises the question whether spoil mounds should first be levelled. Only 0.6 inches of the total of 5 inches of water striking the surface of the levelled banks percolated into the soil when infiltration became constant. The remaining 4.4 inches ran off the soil surface. Infiltration on the undisturbed spoils amounted to 4.0 inches, only 1 inch running off. Infiltration and run-off on an adjacent old field were intermediate, 3.4 and 1.6 inches respectively. Levelled soil in addition to becoming poorly drained and aerated by natural soil-forming processes is usually compacted by heavy levelling machinery.

[127] 631.62
ADOLFSSON, T. **On the influence of the nature of the pipes on the friction resistance in drainage systems.** *LantbrHögsk. Ann. 14, 1947 (373-389).* [E.]

Results of experiments on small-dimensioned conduits of rough, smooth, oval-sectioned, normally and poorly laid tile pipes, and on glass pipes. Badly laid normal tiles (each third pipe displaced 5 mm. from the conduit axis) offered most resistance to flow, and the resistance in oval tiles was also great, due to unevenness at the joins. With rough-surfaced tile pipes, the roughness appeared to exceed uneven joining as a cause of friction.

Laboratory experiments showed that in smooth-walled pipes the resistance varies inversely with the Reynolds number E, where

$E = \frac{v d}{\nu}$, in which v =velocity, d =diameter, and ν =kinematic viscosity, but that with very rough walls the relationship ceases when E has become fairly large. Unevenness at the joins and normal roughness do not destroy the relationship under normal drainage conditions involving comparatively slight velocity and roughness.

[128] 631.67
CLYDE, G. D. **Irrigation in the west.** *U.S.D.A. Yrbk. 1943-1947, 1947 (602-607).* [Div. Irrig. Soil Conserv. Serv.]

Planning of irrigation, practical applications of research on the use of water, land preparation and irrigation systems are surveyed.

[129] 631.67:631.436
ROSEAU, H. **Relation entre les variations de la température du sol et la drainage.** [Connexion between variations of soil temperature and drainage.] *C.R. 225, 1947 (320-322).* [F.]

In lysimeter experiments when outflow was becoming low, a rise or fall of soil temperature (taken at 20 cm.) was associated with a sharp immediate rise or fall in the hourly volume of drainage, irrespective of the type of soil. The temperature range in hoed soils was less than in unhoed soils.

It is suggested that a temperature rise in the upper soil layer causes some evaporation of water still present there, and that some of the vapour formed distils to lower levels, causing accelerated drainage. This type of water loss may be common in arid climates, and the good effects of hoeing in Mediterranean areas may thus be due to a reduction in the water lost by drainage as well as to the atmosphere.

[130] 631.671
FEDOROV, B. V. **[The utilization of waters high in mineral content for irrigation.]** *Pedology 1947 (137-141).* C.A. 41 (6650). [R.]

Drainage waters containing as high as 3 gm. of Cl per l. have been used without ill effects. Formulae are given for calculating the Cl content of the soil after each irrigation, and the possible accumulation of Cl after a number of years.

631.81 FERTILIZERS

(See also Abs. Nos. 3, 21, 224)

[131] 631.81:581.13
WATSON, D. J. **Comparative physiological studies on the growth of field crops. II. The effect of varying nutrient supply on net assimilation rate and leaf area.** *Ann. Bot.* 11, 1947 (375-407). [Rothamsted]

In experiments in which the same crop has been grown continuously on plots receiving fertilizer treatments that have continued unchanged over a long period of years, severe nutritional deficiency has developed on plots where nutrients have been withheld. N fertilizers consistently increased the net assimilation rate, but with mangolds the addition of farmyard manure or K caused a reduction in the response to N. Fallowing caused accumulation of nitrate in the soil and increased the net assimilation rate. P and K reduced, and Na and Mg increased, the net assimilation rate of wheat. Up to the time of maximum leaf area all treatments increased the net assimilation rate of barley, and the effect of each was increased by the presence of the others. Later the effects of N, P and a combined dressing of K, Na and Mg were all negative. With mangolds, P, K and a mixture of Na and Mg all increased the net assimilation rate in the period before maximum leaf area. Subsequently P reduced the net assimilation rate and K, Na and Mg increased it when applied separately, but reduced it when applied together.

In cereals, N increased shoot number and leaf area per shoot. P increased shoot number, but tended to depress leaf area in later stages. K and Na had little effect on shoot number, but increased leaf area per shoot. In mangolds, N and P increased leaf number and leaf size; P, K and Na increased leaf area, mostly in August and September. K and Na had no effect on leaf number. The effects of farmyard manure were similar to those of NPK fertilizer. K may have special functions in relation to photosynthesis, and in mangolds these functions may also be fulfilled by Na.

[132] 651.81:631.42
CROWTHER, E. M. **Memoranda on colonial fertilizer experiments. I. Fertilizer experiments in colonial agriculture.** *Colon. Office No. 214*, 1947 (10-28).

A practical discussion of problems that arise in the designing of experiments in new investigations where there is little previous local experience on either the most appropriate technique or the kind of results to be expected.

[133] 631.81:631.42
STEWART, A. B. **Memoranda on colonial fertilizer experiments. 2. Planning and conduct of fertilizer experiments.** *Colon. Office No. 214*, 1947 (3-9).

Suggestions concerning future colonial fertilizer experiments, which should be of two main types carried out simultaneously: (a) simple experiments in cultivators' fields, to obtain quickly a general picture of manurial response in a major area, and (b) detailed experimental work at carefully selected centres. Statistical and other requirements and limitations are briefly discussed and also important general considerations, including the form of fertilizer supplement (local or imported); rates, times and methods of application; experiments on trace elements, especially where information on yields and soil properties is scanty; use of fertilizers in the production of humus, including green manuring in certain tropical soils; choice of treatments in individual experiments.

631.811 PLANT NUTRITION

[134] 631.811
SCHUFFELEN, A. C.; LOOSJES, A. **The influence of the ion activity and the ion concentration in the medium on the absorption of cations by plants.** *Proc. Netherlands Acad. Sci.* 45, 1942 (944-952). [E.]

In experiments designed to test the hypothesis that absorption of cations is a diffusion process, dependent on the (a_i) medium (the ionic activity of the cation in the medium), the (pH) medium and the (Σc_i) medium (the total salt concentration of the medium), the physiological situation of the shoot and root wall of the plants was kept constant throughout the experiment by control of the factors affecting it (temperature, CO_2 pressure, etc.). Some variations in the situation of the medium—especially in the pH value of media without buffer power—was inevitable, and the arithmetic mean of its initial and final conditions was taken to characterize its situation.

Oat plants were placed in solutions (NaHSO_4) or suspensions (Na-H-bentonite or Na-H-dusarit) of constant $(\Sigma c_i)_{\text{medium}}$, but of varied Na/H ratio, and analysed spectrographically for Na uptake. The results showed that both increase of $(a_i)_{\text{medium}}$, and increase of $(\text{pH})_{\text{medium}}$ result in increased Na absorption, thus qualitatively confirming the hypothesis. The existence in these experiments, however, of a composite relationship between the $(a_i)_{\text{medium}}$ and the $(\text{pH})_{\text{medium}}$ led to 2 further series of experiments (using K-H-acetates as medium) in one of which $(a_i)_{\text{medium}}$ was constant and $(\text{pH})_{\text{medium}}$ varied, and in the other the $(\text{pH})_{\text{medium}}$ was constant and the $(a_i)_{\text{medium}}$ varied. The results of these experiments also agreed with the diffusion hypothesis.

[135] 631.811
ARNON, D. I.; MEAGHER, W. R. **Factors influencing availability of plant nutrients from synthetic ion-exchange materials.** *Soil Sci.* 64, 1947 (213-221). [Univ. Calif., Berkeley]

The chemical properties of a culture medium were investigated in which plant nutrients were supplied in an adsorbed form on synthetic resins known as Amberlites.

The inclusion of adsorbed K in leaching experiments with water, NaCl or HCl as the leaching agent decreased the leachability of Ca and Mg. Inclusion of adsorbed nitrate-Amberlite decreased the leachability of sulphate and phosphate. Availability was increased with an increase in the relative proportions of Ca and Mg or sulphate and phosphate to adsorbed K and nitrate respectively.

[136] 631.811
LUCAS, R. E.; SCARSETH, G. D. **Potassium, calcium, and magnesium balance and reciprocal relationship in plants.** *J. Amer. Soc. Agron.* 39, 1947 (887-896). [Amer. Farm Res. Assoc. Lafayette, Indiana]

A discussion of the reciprocal relationship of the principal basic plant-nutrient cations, and the agronomic implications of this relationship. For example, an excessive application of K is likely to cause the marked deficiency of Mg in tomatoes that has been noted in greenhouse cultivation.

[137] 631.811
SHEAR, C. B.; CRANE, H. L. **Nutrient-element balance.** *U.S.D.A. Yrbk.* 1943-1947, 1947 (592-601). [Bur. Pl. Indust.]

Some of the more important relationships between the essential elements are discussed and also the use of leaf analysis as a means of diagnosing deficiencies.

[138] 631.811 : 537.213
COOPER, H. P.; MITCHELL, J. H. **Chemical composition of the cotton plant grown on different soil types.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (374-377). [S.C. Agric. Expt. Sta.]

Data on the chemical composition of 28 samples of cotton plants selected from different soil types are tabulated. The quantities of elements in the cotton plant are roughly in the order of the relative strengths of the ions as measured by their normal electrode potentials or the intensity of their removal from soil colloid complexes by electrodialysis. Ca is the principal exception. As the cotton plant contains considerably more Ca than might be expected from the relative strength of this ion, cotton may be considered as a Ca-accumulator plant. The cotton plant also contains relatively large quantities of some of the other secondary fertilizer nutrients such as Na, Mg, S and Cl. Under certain soil conditions these nutrients may become limiting factors in the yield of cotton. Expressing the chemical composition of plants in terms of milliequivalents is said to present a clearer picture of nutrient requirements than the percentage composition. It appears that the energy properties of the nutrient ions afford a new and very significant factor in nutritional studies.

[139] 631.811 : 581.192
BEESON, K. C. **Better soils, better food.** *U.S.D.A. Yrbk.* 1943-1947, 1947 (485-498). [U.S. Pl. Soil Nutr. Lab. Agric. Res. Admin., Ithaca, N.Y.]

A review and discussion of research on mineral deficiencies, their correction in plants through fertilizers and the effect on the quality of forages. That the nutritive quality of food is dependent on other factors besides soils and fertilizers is evident in the variations in the ascorbic-acid content of plants such as tomatoes that are caused not by soil conditions or cultural practices, but by the

varying amounts of light received by the tomatoes. Breeding for varieties rich in vitamin C is here more important than alteration of soil conditions.

[140] 631.811:631.414.3
SCHUFFELEN, A. C. De bodemkundige factoren, die de opnemng van kationen door de plant beïnvloeden. [Soil factors influencing the cation absorption of plants.] *Landbouwk. Tijdschr.* 56, 1944 (116-124). *Biol. Abs.* 21 (1510). [Du.]

In the plant, ions are inactivated by colloidal adsorption or by production of organic acids near the surface. This inactivation is supposed to be influenced by oxygen pressure and temperature of the soil and by the presence of glucose in the roots. That ion activity in the soil is more decisive than concentration is shown experimentally by growing oats in artificial soils.

[141] 631.811:631.414.3
TENDELOO, H. J. C.; VERVELDE, G. J.; ZWART VOORSPIJ, A. J. Elektrochemisch gedrag van ionenwisselende stoffen. Potentiaalmetingen aan plantenwortels. [Electrochemical behaviour of exchange cations and anions. Potential measurement of plant roots.] *Versl. Nederl. Akad. Wetensch. Afd. Natuurkunde* 53, 1944 (169-177). [Du.g.e.f.]

Considering plant roots as water solutions of molecules and molecule complexes possessing acid and basic properties inside a thin cellulose membrane, equations are evolved for the relationship between potentials of plant roots and the concentrations of surrounding cations and anions, using the Donnan equilibrium. It is shown that the concentration of the diffusible anion of the Donnan equilibrium does not remain constant, owing to the fact that such anions partake in the dissociation equilibrium which varies with varying pH values of the outer medium.

It is theoretically possible to characterize plant roots by their dissociation constant, together with the concentration of "root acidoids."

[142] 631.811:631.414.3
BURD, J. S. Mechanisms of release of ions from soil particles to plants. *Soil Sci.* 64, 1947 (223-225). [Univ. Calif., Berkeley]

The absorption of ions by plant roots cannot be fully explained either as a process of extraction from the soil solution or of contact exchange between the roots and the solid phase of the soil. A clearer conception of the mechanism of absorption can be obtained by recognizing the existence of an intermediate phase or interphase between the soil solution and the soil particle. This interphase consists of a layer of oriented water molecules surrounding the ions absorbed on the soil particles. The interphase is not an equilibrium condition, and its pH cannot be measured, but there are grounds for believing that the pH is lower than that of the soil solution, the H^+ concentration of which is often insufficient to cause an exchange of H^+ for absorbed cations. In contact exchange it is assumed that ions are detached from the soil particles and enter the interphase so that they are not at any time a part of the homogeneous liquid phase commonly known as the soil solution.

[143] 631.811.2:539.16
BARBER, S.; MITCHELL, J.; SPINKS, J. W. T. Soil studies using radioactive phosphorus. *Canad. Chem. Process Indust.* 31, 1947 (757-758, 761). C.A. 41 (6647). [Univ. Saskatchewan]

The radioactive P is converted to phosphate and mixed with the inactive P fertilizer. By quantitative measurements of the radioactivity, the radioactive P and hence the inactive fertilizer P can be followed. The use of P as a quantitative tracer for the fertilizer P is independent of any reaction which the P may subsequently undergo. The object of the study was (a) to obtain an estimate of the amount of fertilizer used by wheat plants growing on a particular soil in a given seam, (b) to measure the percentages of P taken from the fertilizer and from the soil, (c) to obtain an indication of the period of growth over which the fertilizer was taken up most rapidly, (d) to determine the extent of the movement, if any, of fertilizer P in the plant during its development. The procedure is outlined. There was an appreciable uptake of fertilizer P until the heading stage with large uptake by the plant in later stages of growth, but the P coming from the fertilizer after heading was small. There was a transfer of P from leaves and stems to the head as maturity came. The P coming

from fertilizer appeared uniformly mixed with the P from the soil in the different parts of the plant. Approximately 22% of the applied P was taken up by the plant.

[144] 631.811.4/5
THORNE, D. W. **Calcium carbonate and exchangeable sodium in relation to growth and composition of plants.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (397-401). [Utah Agric. Expt. Sta.]

Tomatoes were grown in bentonite clay saturated with Ca or Na and treated with a complete nutrient solution. CaCO_3 was added in amounts equivalent to clay: CaCO_3 ratios between 20:1 and 1:2.

Growth of tomato plants decreased with increased amounts of CaCO_3 and of exchangeable Na. Growth of barley was little affected by increasing concentrations of CaCO_3 ; its growth decreased only at the highest level of CaCO_3 used. The chemical composition of barley was also much less affected by CaCO_3 than was that of the tomato plants. Over the alkaline soil range exchangeable Na and CaCO_3 were more important factors than pH in controlling P availability to plants.

631.811.9 TRACE ELEMENTS

(See also Abs. Nos. 64, 179, 226)

[145] 631.811.9
DROSDOFF, M. **The use of minor elements.** *U.S.D.A. Yrbk.* 1943-1947, 1947 (577-582). [Bur. Pl. Indust.]

[146] 631.811.9: 546.27
NARTEL J. A. **Boron research in agriculture.** *Amer. Fert.* 107, No. 9, 1947 (7-8, 24-26).

Boron fertilization problems are reviewed and an account given of the present status of boron research.

[147] 631.811.9: 546.35
BERTRAND, G.; BERTRAND, D. **Recherches sur le rubidium des phanérogames. [Investigations on the rubidium of phanerogams.]** *C.R. Acad. Sci.* 222, 1946 (423-426). [F.] *Ann. Agron.* 17, 1947 (149-153). [F.]

The Rb content of the 68 species analysed varied from 0.6 mg./kg. dry matter in rye to 98.5 mg./kg. dry matter in rushes (*Juncus*

effusus L.). The Rb content varies considerably with the different species, the Cruciferae appearing to have on an average three times as much as the Gramineae or Leguminosae. The medium, however, appeared to be more important than the species in determining the Rb content, the highest contents being found in plants growing in moist clay soils.

[148] 631.811.9: 577.17
MITCHELL, J. W. **Plant growth regulators.** *U.S.D.A. Yrbk.* 1943-1947, 1947 (256-266). [Bur. Pl. Indust.]

The use of plant hormones in modifying the physiological activities of plants, rooting cuttings and also as weedkillers.

631.816.3 FERTILIZER PLACEMENT

(See also Abs. Nos. 215, 317, 329, 396)

[149] 631.816.3
HANLEY, F. **Fertilizers for combine drilling.** *J. Min. Agric.* 54, 1947 (354-357). [Sch. Agric., Cambridge]

Combine seed-and-manure drilling for cereals saves time and labour, economizes on fertilizer and gives good crops from a smaller fertilizer dressing than when fertilizer is broadcast. Up to 3 cwt./acre of super. can be combined with cereal seed under normal soil and weather conditions with no risk of injury to germination; 1½-2 cwt. is usually sufficient. For sugar beet and root crops generally, sowing seed and fertilizer together is risky, but super. at not more than 2 cwt./acre may be combine-drilled with seed on P-deficient soils. Under dry soil conditions and on land not seriously deficient in P it is best to broadcast the P. Sowing peas and beans in direct contact with any fertilizer is always risky. Grass-and-clover seed mixtures show marked response to combine drilling with 3 cwt./acre of super. on P-deficient land.

Although substantial benefits have resulted from combine drilling of ½-1 cwt./acre of muriate of potash with cereal seeds, any but very small dressings have injured germination of almost all common farm crops. ½ cwt./acre of $(\text{NH}_4)_2\text{SO}_4$ combine-drilled with cereal seed on land deficient in N is advantageous. There is no evidence that, on soils of reason-

able fertility, N fertilizer applied in this way is more effective than the same fertilizer broadcast. For other farm crops, combine-drilled N fertilizer is not more effective, and, to avoid injury to germination, any quick-acting N fertilizer should be broadcast.

Up to 3 cwt./acre of a mixture of P and N fertilizers may be combine-drilled with cereals, provided it does not contain more than 1 cwt. of $(\text{NH}_4)_2\text{SO}_4$. If 3 cwt./acre of NPK mixture be used, $\frac{1}{2}$ - $\frac{3}{4}$ cwt./acre of $(\text{NH}_4)_2\text{SO}_4$ and $\frac{1}{4}$ cwt./acre of muriate of potash are sufficient. $\frac{3}{4}$ -1 cwt./acre of ammonium phosphate can be safely used for combine-drilling. For all crops other than cereals it is generally safer to broadcast fertilizer mixtures.

[150]

631.816.3

MILES, R. O. **The placement of fertilizers. A summary of the present state of knowledge on the subject in Great Britain.** *Jealott's Hill Res. Sta. Bull.* 4, 1947, pp. 31.

The advantages of placement over broadcasting that have been recorded in Britain include saving of labour by combining fertilizing and seeding in one operation, increase in yield and tillering (of cereals), reduction of weed growth and P fixation, better establishment and early growth, earlier ripening and increased resistance to wireworms. On an average combine-drilling of a complete fertilizer has given twice the yield increase of cereals obtained by broadcasting. Combine-drilling for root crops is more dangerous, but can be effective on highly nutrient-deficient soils. The most satisfactory placement for a complete fertilizer for swedes has been in bands $1\frac{1}{2}$ inches to the side and 1 inch below the seed. P fertilizers are the safest and K the least safe to apply in contact with seed. Mixtures are generally more dangerous than their separate components. Soil and weather conditions, particularly in relation to moisture, are important factors. As a general rule, up to 3 cwt./acre of a fertilizer mixture can be sown in contact with cereals without risk. No noticeable residual effects from placed as compared with broadcast fertilizers have been observed. Special machinery requires to be developed for placement.

The available information on placement for different crops in Britain is summarized in a table.

[151]

631.816.34

ROBERTS, W. O. **Simplifications of the Roach method of diagnostic plant injection.** *J. Pomol.* 22, 1946 (184-188).

Two modifications are described of the Roach method of diagnostic injection for the detection of nutrient deficiencies in plants. In one, a short length of soft cotton thread, impregnated with the test solution and dried, is drawn with a fine darning needle through a leaf petiole or other tissue; the thread is cut on each side to leave a short length in the tissue. In the other, a pad of cotton wool moistened with the test solution is bound with waterproof surgical or insulating tape over the wound caused by removing a leaf at the base of its petiole. The distribution of the reagent and the consequent development of chlorophyll were the same as those resulting from the Roach tube method of injection.

[152]

631.816.34

COOPER, P. S. **Plant injections for diagnostic and curative purposes.** *E. Afric. Agric. J.* 13, 1947 (37-53). [Dept. Agric., Uganda]

The use of a hypodermic syringe for plant injections in the diagnosis of mineral deficiencies is described. The advantages and disadvantages of methods used are discussed and it is shown that there are few disadvantages. Three methods are described, two referring to leaf injections and one to stem injections, and the type and strength of chemical solutions used are given. The effect of both chemical and mechanical damage is indicated. Symptoms attributable to deficiencies and the results of typical injections of N, P, K, Ca, Mg, Fe, Mn, Zn and B are described.

Diagnostic injections made by syringe have been corroborated by means of tablet injections.

[153]

631.816.34

FELBER, I. M. **Direct introduction of chemical substances into herbaceous plants.** *Science* 106, 1947 (251). [Michigan St. Coll., East Lansing]

A length of mending cotton, soaked to saturation in the solution to be tested, may be drawn with a needle of florist's steel wire or plastic or glass fibre through the desired part of the plant, and left in the tissue. If a

continuous supply of the substance is desired the end of a long thread may be left immersed in the solution. A thread impregnated with a solution of 2,4-D, dried and then introduced, is effective in testing the responsiveness of specific parts of plants, to 2,4-D and the transport of 2,4-D within the plant.

631.821/2 LIME AMENDMENTS

(See also Abs. No. 19)

[154] 631.821.1 : 546.27 : 581.192
ROLL-HANSEN, J. Kalksteinsmjøl i stigende mengder dels med, dels uten bor. Kalksteinsmjøl brukt, dels sammen med torv, dels sammen med kunstgjødsel og dels sammen med husdyrgjødsel. [Ground limestone applied in increasing amounts with and without added boron. Limestone used with peat, artificial fertilizers and farmyard manure.] *Meld. Stat. Forsøksgard Grønssakdyrking, Kvithamar* 1945 (G21-G56). [N.e.]

The limestone was applied together with either 40 cart loads of manure/decare or artificials equivalent to this. The soil was a clayey mould of high buffer capacity, and limestone—even 2000 kg./decare—had little effect on the pH, but caused a pronounced B deficiency and decreased the yield of garden beet and carrots. It increased the proportion of cracked carrots from 8.2 to 20.3% and caused brown heart and uneven corky surface in swedes, but did not affect yields of swedes or leeks. 1½ kg. of borax/decare neutralized the injurious effects of limestone on yields, reduced the proportion of cracked carrots to 10.7% and restored the quality of swedes. When B was applied, plant material generally was lower in N, and the leaves of garden beets (on limed soil) contained less P and more Ca than when B was not applied. Leek yields were lower with manure than with artificials, but celeriac yielded the same with either treatment. A supplement of 6000 kg. of peat/decare reduced the injurious effects of liming without decreasing the soil pH. Addition of potash salt reduced the intake of Ca and B in celeriac, whether the soil was limed or unlimed.

[155] 631.821.1 : 631.416
BONNET, J. A. Tracing the calcium, phosphorus and iron from a limed and

unlimed lateritic soil to the grass and to the animal blood. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947, (295-297).

Available Ca and P were increased in limed soil 15 and 23 months after liming, and available Fe and Mn were decreased. Liming did not appreciably alter the available Mg content. The Ca and P contents of grass grown on the limed plots were higher and the Mn content was lower than on the unlimed plots for the second, third and fourth crops. The Fe content of the limed grass was higher for the second and lower for the third and fourth crops. The Mg content was higher for the second and third crops and lower for the fourth crop.

[156] 631.822 : 552.323.5
VILLIERS, O. D'HOTMAN DE. Sur les résultats d'études relatives à la réjuvenation de nos sols épuisés des régions humides par incorporation de poussière basaltique. [Results of studies on the rejuvenation of our exhausted soils of the humid regions through the incorporation of basalt dust.] *Rev. Agric. Maurice* 26, 1947 (160-175). [F.]

Application of basalt dust at the rate of 30 and 90 tons per arpent (0.84 acre) increased the yield of sugar cane by 1.8 and 3.5 tons per arpent respectively over the control. The rate of extraction was increased for the third and fourth ratoons by both applications. The 90-ton application doubled the increment in yield of cane given by the 30-ton application, and the extraction rate was also greater. It is pointed out that basalt is a substance with a high specific heat, and has an effect on the soil climate. It contains 16 essential plant nutrient elements.

631.83 POTASH FERTILIZERS

(See also Abs. No. 178)

[157] 631.83 : 545
EWAN, M. A. ; FORD, O. W. Effect of the saturation of acid-alcohol with potassium chloroplatinate in determination of potash in fertilizers. Abs. in *Amer. Fert.* 106, No. 5 (24). [Purdue Agric. Expt. Sta.]

An examination of the results of K determinations made by the Official Method for Potash in Fertilizers, indicates that slightly higher values are obtained where the acid-

alcohol is saturated with K_2PtCl_6 . Determinations were made on samples with a K_2O content ranging from 8 to 27%. In addition, the effect of using K-free normal sodium acetate in place of K-free normal NaOH was investigated.

631.84 NITROGEN FERTILIZERS

(See also Abs. Nos. 207, 209, 276)

[158] 631.84
PARKER, F. W. **Use of nitrogen fertilizers.** *U.S.D.A. Yrbk. 1943-1947, 1947* (561-564). [Bur. Pl. Indust.]

The N content of the soil, rainfall, the cropping and farming system and the value of the crop per acre are the factors affecting the amounts of N to be used.

[159] 631.84 : 631.816.1
BLACK, C. A. ; NELSON, L. B. ; PRITCHETT, W. L. **Nitrogen utilization by wheat as affected by rate of fertilization.** *Proc. Soil Sci. Soc. Amer. 1946, 11, 1947* (393-396). [Iowa Agric. Expt. Sta.]

The efficiency of utilization of N fertilizer decreased with increasing rates of application and with increasing availability of the soil N. It is considered that the determination of mineralizable N may have some merit as a test for the availability of N in the soil. The mineralizable soil N as determined by incubation in the laboratory showed a direct relationship to the yield of wheat and an inverse relationship to the response of wheat to N fertilization.

[160] 631.84 : 631.816.2
LARSEN, J. E. ; KOHNKE, H. **Relative merits of fall- and spring-applied nitrogen fertilizer.** *Proc. Soil Sci. Soc. Amer. 1946, 11, 1947* (378-383). [Purdue Univ. Agric. Expt. Sta.]

Experiments on fallow and with maize showed that ammoniacal fertilizers may be ploughed under in the autumn. There was no difference in yields of maize between autumn and spring applications of fertilizer.

[161] 631.841.7
YEE, J. Y. ; LOVE, K. S. **Nitrification of urea-formaldehyde reaction products.** *Proc. Soil Sci. Soc. Amer. 1946, 11, 1947* (389-392). [Bur. Pl. Indust., U.S.D.A., Beltsville, Md.]

The availability of N in the urea-formaldehyde products was determined by nitrification experiments at 30°C. The net nitrification values for incubation periods of 2 to 24 weeks increased with an increase in the urea/formaldehyde (U/F) ratio of the product. Materials with U/F ratios ranging from 1.4 to 2.0 nitrified at rates closely approaching those of $(NH_4)_2SO_4$ and dried blood. Materials with U/F ratios 0.88 and 1.03 nitrified too slowly for practical fertilizer purposes. The most promising products were those with U/F ratios ranging from 1.18 to 1.36. Urea-formaldehyde products may be used either alone or in mixtures with more quickly available forms of N.

[162] 631.841.8
ANDREWS, W. B. ; EDWARDS, F. E. ; HAMMONS, J. G. **Ammonia as a source of nitrogen.** *Sug. J. 10, No. 3, 1947* (5-8). C.A. 41 (7034). [Miss. Agric. Expt. Sta.]
A discussion on the use of anhydrous NH_3 for direct application to the soil.

631.85 PHOSPHATE FERTILIZERS

[163] 631.85
PIERRE, W. H. **Phosphate fertilizers.** *U.S.D.A. Yrbk. 1943-1947, 1947* (554-560). [Iowa St. Coll. Ames]

A short description of phosphate materials used in U.S.A. and of research on soil requirements and efficient use of phosphate fertilizers, and of their residual value.

[164] 631.85 : 546.185
HILL, W. L. ; HENDRICKS, S. B. ; FOX, E. J. **Acid pyrophosphate and metaphosphates produced by thermal decomposition of monocalcium phosphate.** *Abs. in Amer. Fert. 106, No. 5 (24).* [U.S.D.A., Beltsville, Md.]

Monocalcium phosphate was heated at temperatures below 600°C. and the compounds formed under different heating conditions were determined together with the physical constants adequate for their identification. Four crystalline compounds—calcium acid pyrophosphate and three low-temperature monotropic modifications of calcium metaphosphate—and an amorphous phase were recognized and identified.

Monocalcium phosphate monohydrate is known to undergo partial fusion when it is

heated rapidly in the open at 150-200°. The resultant horny mass, usually a mixture of compounds, is converted to stable beta-calcium metaphosphate at 600-700°. Fusion can be avoided by first heating the charge at 125°, to expel water of crystallization, but further heating in the range 200-600° yields an unpredictable mixture of phases, consisting of glass-like amorphous material and one or more of at least three crystalline phases. On the other hand, the anhydrous salt, obtained either by drying the hydrate or by crystallization from solution, readily loses water in an atmosphere of steam at 275-300° and changes smoothly into calcium acid pyrophosphate with the formation of little or no amorphous material. An essentially pure amorphous material can be prepared by heating extremely thin flakes of mono-calcium phosphate monohydrate. At 350° in steam crystalline acid pyrophosphate is converted into a mixture of two low-temperature modifications of calcium metaphosphate with more or less amorphous material which, being soluble in water, can be leached from the insoluble crystalline compounds. Formation of a third crystalline metaphosphate is enhanced by the presence of sulphate. This modification is structurally similar to, and apparently forms a solid solution with, anhydrous calcium sulphate (anhydrite).

[165] 631.85 : 546.185-35
MACINTIRE, W. H.; WINTERBERG, S. H.; CLEMENTS, L. B., ET AL. **The fertilizer effectiveness of liquid orthophosphoric acid.** *J. Amer. Soc. Agron.* 39, 1947 (971-980).

Measured by crop response and by P_2O_5 content, and by P_2O_5 recovery in rye grass and in red clover, H_3PO_4 was slightly less effective than super. Variation of the dilution of the H_3PO_4 did not result in significant difference in crop response, in P_2O_5 content or in P_2O_5 recovery, regardless of rate of addition or mode of incorporation.

[166] 631.85 : 632.19 : 546.47
MILLIKAN, C. R. **Effect of phosphates on the development of zinc deficiency symptoms in flax.** *J. Dept. Agric. Victoria* 45, 1947 (273-279).

Excess phosphate induced Zn-deficiency symptoms in flax. The effect of di-sodium phosphate was significantly greater than that of super. The difference is ascribed to the higher content of Zn as an impurity in the

super. though the di-sodium phosphate may have been more readily available to the plant than the super. Deficiency symptoms were more severe in a winter sowing than in an early spring sowing.

[167] 631.858
JACOB, K. D.; WARD, F. N.; HILL, W. L., ET AL. **Report on phosphoric acid: neutral ammonium citrate and two per cent citric acid solutions as solvents for alpha phosphate.** *J. Assoc. Off. Agric. Chem.* 30, 1947 (529-548). [U.S. Bur. Pl. Indust., Beltsville, Md.]

Alpha phosphate is a generic name used for sintered, fused or calcined products obtained by heating natural phosphate at high temperatures in the presence of silica and water vapour for the purpose of converting the P_2O_5 into forms available to plants, principally alpha tri-calcium phosphate. The "solubilities" of alpha phosphate in neutral ammonium-citrate and 2% citric-acid solutions are not increased by grinding the materials finer than 200 mesh. In "solubility" determinations on 18 samples of phosphate rock and fluorapatite, 5-13% of the total P_2O_5 was extracted from the phosphate rock by neutral ammonium citrate and 2% from the fluorapatite. 2% citric acid extracted 2-4 times as much P_2O_5 from natural calcium phosphate as did neutral ammonium citrate, but it extracted only slightly more P_2O_5 from alpha tri-calcium phosphate than did ammonium citrate. Neither dissolves all the P_2O_5 from pure alpha tri-calcium phosphate when the ratio of sample to extractant is 1 gm. per 100 ml.

The solubility of partially defluorinated rock begins to increase when the ratio of P_2O_5 to F is between 11.2 and 22.4. The citrate solubility of alpha phosphate of low F content (0.5% or less) is 63-95% of the total P. Sintered, fused and calcined material all showed the same range of "solubility." Citric-acid solubility is usually higher than citrate solubility. In alpha phosphate with less than 0.5% of F the average difference for 33 samples was 3.4% of the total P.

631.86/7 ORGANIC FERTILIZERS

(See also Abs. No. 91)

[168] 631.86/7
BARTHOLOMEW, W. V. **The influence of soils and soil management practices on**

plant food requirements. *Amer. Fert.* 107, No. 4, 1947 (7-8, 22-24), No. 5, 1947 (9, 24-28). [U.S.D.A., Beltsville, Md.]

The need for fertilizers is reduced where farming practices return most of the plant nutrients to the soil as manure or crop residues. In a maize-oats-clover rotation producing 50 bushels of maize, 50 bushels of oats and 2 tons of clover to the acre, about 65 lb. of N, 24 lb. of P_2O_5 and 62 lb. of K_2O are taken up by the crops. If the oat straw and maize stover are left on the land about 53 lb. of N, 18 lb. of P_2O_5 and 34 lb. of K_2O per acre are removed each year. When all the crops are fed on the farm and the manure returned to the land, only 20 lb. of N, 7 lb. of P_2O_5 and 8 lb. of K_2O per acre are ultimately lost from the soil.

[169] 631.86/7 : 631.81
ACHARYA, C. N. ; SABNIS, C. V. ; MENEZEST, F. G. T. **Pot culture experiments on the manurial values of composted and uncomposted materials.** *Indian J. Agric. Sci.*, 16, 1946 (178-186). [Indian Inst. Sci., Bangalore]

Pot experiments with ragi were made on a P-deficient soil to compare the effects of (1) night-soil and wood-ash poudrette, (2) night-soil and town-refuse compost, (3) farmyard manure, (4) farm-refuse compost and (5) ammonium sulphate. The effectiveness of the manures, measured by crop increases, was in the above order, (1) being the best. All the manures except ammonium sulphate had a residual effect on a following crop of jowar. The P and K contents of the manures were not determined. There was no clear connexion between the effectiveness of a manure and its C/N ratio.

When various uncomposted farm residues were used it was found that residues with C/N ratio greater than 50 depressed, and those with C/N ratio less than 30 increased, yields. Sugar-cane trash depressed yields of ragi, but a significant increase was obtained when ammonium sulphate containing N equal to 1% of the weight of the trash was also added. This mixture was more effective than the same quantity of ammonium sulphate alone. Hougay oil cake was even more effective than ammonium sulphate (on an equal-N basis) in overcoming the depressing effect of cane trash, probably on account of its P content.

[170] 631.86/7 : 631.81
MEREDITH, D. **A comparison of inorganic fertilisers and compost on natural pastures in South Africa.** *Emp. J. Expt. Agric.* 15, 1947 (189-194). [Afric. Expt. Chem. Indust. Johannesburg]

Compost and fertilizers were applied on two veld types at two levels over two 2-year cycles, and yields of dry matter were obtained from four cuts in the first cycle and seven in the second. The yields of dry matter showed a greater response to N in inorganic than in organic form. In both cycles the response was greater on a disturbed or old fallow-veld type than on the undisturbed veld. Recoveries of N ranged from 3.4 to 12.8% in the compost treatments and from 12.8 to 27.7% in the fertilizer treatments. The yield of dry matter per lb. of N applied ranged from 2.5 lb. in a heavy compost treatment to 21.9 lb. in the fertilizer treatments. The returns of N and also yields of dry matter per lb. of N were higher for low than for high compost dressings.

It is therefore suggested that if compost is to be used on veld pastures it should be applied frequently in small amounts. In general P recoveries were low, the high-fertilizer treatment giving the best return.

[171] 631.86 : 631.812
HISSEICH, M. H. **Le gaz de fumier en Allemagne. [Manure gas in Germany.]** *Land, Wald und Garten*, May 1947. *Potasse* 21, 1947 (182-183). [F.]

By a rapid process of fermentation of farmyard manure, involving mechanical chopping and heating to about 35°C, a manure of superior quality may be obtained within 24 hours, and the evolved methane compressed for use as fuel.

[172] 631.863
GILLES, E. C. **Composting.** *Farm and Forest* 7, 1946 (92-102).

The Kano method of composting night soil and domestic waste material is described.

[173] 631.87 : 631.416.1
OWEN, O. ; ROGERS, D. W. **The availability of nitrogen in some organic fertilizers.** *Cheshunt Expt. Res. Sta. Rept.* 1946, 1947 (66-70).

It is usually considered that N in hoof and horn becomes available more slowly than in

dried blood and is therefore available over longer periods. In these experiments not only was there little difference between the amounts of N formed from dried blood and hoof and horn, but in all cases nitrification did not begin until after five days, and with dried blood there was definite denitrification immediately after mixing.

Other materials tested were bone meal, guano, whale meal, chamois meal, leather shavings, acidulated leather meal, treated leather, fish guano and meat and bone tannage.

[174] 631.875 : 631.812
LAERA, R. VAN. La compostière. [A composter.] *Bull. Agric. Congo Belge* 38, 1947 (655-658). [F.fl.] [M'vuazi Expt. Sta. Congo Belge]

Description and management of the composter at the M'vuazi fruit experiment station. 5 tons per month are produced by the Indore process from all forms of un-lignified plant matter, cow dung and wood ash.

[175] 631.875 : 631.879.2
JOSHI, K. G. Technique of testing sewage sludges and composts. *Indian East. Engr.* 94, 1944 (304-305). C.A. 41 (6010).

Directions are given for the analysis of sludges and composts. Sewage sludge is a good source of N and P; compost fertilizers contain more humus in their organic substance than sludges, due to their longer period of decomposition. The organic form of P_2O_5 which is soluble in n. HCl is absent from compost but present in sludges.

[176] 631.876.9 : 675
MEYER, C. Proeven met gestoomd ledermeel. [Experiments with steamed leather meal.] *Landbouwk. Tijdschr.* 683, 1943 (701-710). *Biol. Abs.* 21 (1490).

Leather steamed under pressure was sometimes more and sometimes less effective than ammonium nitrate on potatoes and spring wheat.

[177] 631.879.2
GARRICK, P. Straw-sludge composts. *J. Soc. Chem. Indust.* 66, 1947 (257-259).

Fresh sewage-sludge contains approximately 30% (on dry matter basis) of ether-soluble substances. While the saponifiable

fraction disappears quickly from both the sewage sludge and composts, the unsaponifiable fraction is much more resistant to decomposition by micro-organisms.

632 PLANT DISEASES AND PROTECTION

(See also Abs. Nos. 13, 211, 212, 217, 241, 267, 269, 282, 286, 287, 292, 298)

[178] 632.111 : 631.83
TSVETOUKINE, M. Potasse et gelée. [Potash and frost.] *Potasse* 21, 1947 (168). [F.] [Sta. Amélior. Plantes, Rennes]

The severe cold of the winter of 1946-1947 caused far greater damage to wheat (sown after clover) and colza (sown after winter cereals) on plots not receiving K than on those receiving 200 kg. of muriate of potash/ha. All plots had received identical P and Ca treatments.

[179] 632.19 : 631.816.34
ROBERTS, W. O.; LANDAU, N. Multiple mineral deficiencies in fruit trees: injection as a first aid treatment. *J. Pomol. Hort. Sci.* 23, 1947 (80-91).

Injection with solid tablets containing salts of K and trace elements was used to control a serious die-back of fruit trees that was shown by leaf analysis to be due to deficiencies of K and of either Fe or Mn or both. During the war, applications of K fertilizers had practically ceased, and large amounts of N and lime had been applied. It was found that Ca was present in abnormally large quantities in the leaves with sub-normal amounts of Fe. Leaf analyses during the year following the treatment showed that injection of K salts into the trunk of a K-deficient tree increased the K content of the leaves. Injection of a trace element into a tree deficient in both K and the trace element led to the unexpected result of curing both deficiencies and increasing the K content of the tree. The K content of samples from Fe-injected trees decreased in June, but by the end of July it was 28% higher than in the control. When K_2SO_4 plus $FeSO_4$ were injected into a tree the K content of the samples was, by the end of July, 50% greater than in the control and 73% greater than that of the K_2SO_4 -injected

tree. The injections improved the appearance of the tree except when K_2SO_4 was used alone. Trees remote from the die-back area did not respond to the injections.

[180] 632.4 : 631.432.2
DORAN, W. L. **Annual report for year ending 30th June, 1946.** *Mass. Agric. Expt. Sta. Bull.* 436, 1946, pp. 70. R.A.M. 26 (378).

Damping-off is much less severe if soils with a moisture content of 30% of the water capacity at the time of seeding are not watered for 4 or 5 days afterwards. The use of fertilizer as a fungicide carrier is promising. Cabbage club root (*Plasmodiophora brassicae*) and soil-borne onion diseases were controlled with pyridyl mercurichloride or ethyl mercury phosphate in limed soil. The yield of onions in soil infested with pink rot (*Fusarium vasinfectum* var. *zonatum* f.1) was increased by applying 70 lb./acre of thiosin and 50-70 lb./acre of ferment. Dithane, tetramethyl thiuramdisulphide and phygon at 2.5, 0.6 and 0.45 gm. per square foot applied with fertilizer to soil infested with *Pythium* spp. improved stands of onion, cabbage, tomato, beet, chilli pepper, peas and cress.

[181] 632.4 : 631.432.2
MELHUS, I. E.; BUCHHOLTZ, W. F.; MURPHY, H. C. **Report 1945-1946. Part I.** *Iowa Agric. Expt. Sta. Rept.* 1946 (166-202) R.A.M. 26 (380).

Barley and maize grown in soil infested with *Pythium graminicola* used only half as much soil moisture as plants grown in steamed uninfested soil and had only half the top growth. Soil-moisture utilization as measured by top length was similar at high and low soil-moisture levels, but on a weight basis soil-moisture utilization was distinctly low at low moisture level in infested soil. For oats the differences between plants in infested and non-infested soil were smaller.

[182] 632.4 : 631.432.2
PORTER, R. H. **Germinability of treated and untreated lots of vegetable seed in Pythium-infested soil and in the field.** *Iowa Agric. Expt. Sta. Res. Bull.* 345, 1946 (949-983).

Silt loam of pH 7.5 infested with *Pythium debaryanum* Hesse and *P. graminicola* Subr. and mixed with two parts of sand, was

unfavourable to the germination of untreated vegetable seeds when the temperature was 10°C. Emergence was greater in dry soil and the number of seedlings that damped-off increased as the soil moisture content increased above 15%.

[183] 632.4 : 631.433.1
SAROJINI, T. S.; YOGESWARI, L. **Aeration affecting growth and sporulation of some soil *Fusaria* in liquid cultures.** *Proc. Indian Acad. Sci.* 26B, 1947 (69-76). [Univ. Bot. Lab., Madras]

Aeration removes the stale gases of metabolism and ensures a pure supply of oxygen, thereby accelerating the growth of a fungus both in soil and in culture media. A study made of *Fusarium vasinfectum*, *F. moniliforme* and *F. udum* (isolates from cotton, paddy and pigeon-pea root rot), by growing the fungi in aseptically aerated liquid-culture solutions containing organic and inorganic nutrients, confirmed previous observations on soils that fungal infestations decreased with decrease in soil aeration. Aeration stimulated mycelial growth, but inhibited sporulation.

[184] 632.554.21 : 632.954 : 577.15.04
CARLSON, R. F. **Destruction of quackgrass rhizomes by isopropylphenylcarbamate.** *Mich. Agric. Expt. Sta. Quart. Bull.* 29, 1947 (274-280).

Greenhouse trials showed that concentrations above 500 p.p.m. sprayed onto rhizomes of quackgrass (*Agropyron repens*) which were later buried prevented them entirely from regenerating new shoots. With 100 p.p.m. very few leaves appeared. Mixtures of equal amounts of 2,4-D and isopropylphenylcarbamate (IPC) at various concentrations were inferior to IPC alone in preventing shoot regeneration of rhizomes dipped in them. The selectivity of IPC suggests the possibility of using it in conjunction with summer fallow and with cultivation of row crops, by spraying rhizomes cultivated to the surface. The leaves of quackgrass are hardly injured by concentrations of 1000 p.p.m.

[185] 632.595.16 : 633.3
ANDREWS, F. W. **The parasitism of *Striga hermonthica* Benth. on leguminous plants.** *Ann. Appl. Biol.* 34, 1947 (267-275). [Dept. Agric., Sudan]

Pot experiments at the Gezira Research Farm showed that *Striga hermonthica* can parasitize groundnuts, cowpea, dolichos bean and soybean although the *Striga* plants developing on the roots of these hosts are small. The sowing of these leguminous crops in a *Striga*-infested soil must rid the soil of a large proportion of its *Striga* seed. A sorghum or other cereal crop could then follow.

[186] 632.651.6
EVANS, A. C. **Earthworms.** *J. Bd. Greenk. Res.* 7, 1947 (49-54). [Rothamsted]

On pasture land at Rothamsted, activity and casting are low in winter. If the soil remains moist during March, the number of worms coming to the surface decreases slightly, but the amount of casting falls rapidly and remains low until September. If the soil dries out during March the numbers of worms and of castings fall rapidly. Activity increases in September, with increasing soil moisture, to a maximum at the end of the month and then declines according to soil moisture and temperature. Casting reaches its peak towards the end of October. Statistical examination strongly suggests that *Allolobophora nocturna* and *A. longa* are almost solely responsible for casting and that a field may have a high earthworm population but a low production of wormcasts. These two species and one other are the only ones that have been captured feeding on the surface at night and it is suggested that casting might be prevented, without exterminating a great proportion of the worms, by dusting the surface with a worm-killer at sufficient concentration to kill off the surface-feeding species. The worm population of a field at Rothamsted is estimated at three million/acre, or weights of 2-12 cwt./acre according to the age of the pasture.

[187] 632.651.6 : 631.434
HOPP, H. ; HOPKINS, H. T. **Earthworms as a factor in the formation of water-stable soil aggregates.** *J. Soil Water Conserv.* 1, 1946 (11-13). [U.S.D.A., Beltsville, Md.]

In laboratory culture tests with unsterilized field soil, that containing earthworms consisted partly of excreted casts and partly of broken lumps. Soil that contained

no earthworms was compact and unbroken. Aggregates from cultures containing no earthworms were 4.47% water-stable ; those formed by earthworms in 4 days were 15.68% water-stable. There is no evidence that earthworm aggregates acquired stability over a period of weeks as a result of stimulated microbial activity. Actually, incubation of cultures for 4 weeks resulted in loss of water stability.

[188] 632.651.6 : 631.452
EVANS, A. C. ; GUILD, W. J. M. **Studies on the relationships between earthworms and soil fertility. 1. Biological studies in the field.** *Ann. Appl. Biol.* 34, 1947 (307-330). [Rothamsted]

Soil temperature and moisture determine both the activity of earthworms and the weight of soil thrown up as wormcasts in autumn, winter and spring. There was evidence that of the species studied, only *Allolobophora nocturna* and *A. longa* were responsible for wormcasts. At Rothamsted old permanent pasture had a high percentage of *A. nocturna* and a lower percentage of *A. caliginosa*. Ploughing old permanent pasture and reseeded to grass after 1-2 years of cultivation reduced the proportions of these two species and increased *Eisenia rosea*. *A. chlorotica* is the dominant species in arable fields. Pasture fields 2-7 years in grass after many years of arable farming still showed a high percentage of these species and a low proportion of *A. nocturna*. In the Carse of Stirling, Scotland, soil type was an important factor in determining the earthworm population. The dominant species in pasture land at Rothamsted was not found at Stirling.

[189] 632.651.6 : 632.951
BAKER, W. L. **DDT and earthworm populations.** *J. Econ. Ent.* 39, 1946 (404-405). B.A. BIII. 1947 (92).

During winter and early spring, ground covered with leaves from elm trees sprayed the previous autumn with a 0.25% DDT emulsion was left undisturbed by earthworms. Adjoining ground where no DDT was used showed marked earthworm activity, the forest floor being almost denuded of leaves. By the end of May there was no noticeable difference between sprayed and unsprayed areas.

[190] 632.7:632.951
HAVILAND, E. E. **Biology and control of the Allegheny mound ant.** *J. Econ. Ent.* 40, 1947 (413-419). [Univ. Md.]

Mounds of *Formica exsectoides* are rounded cones 1-3 feet high, kept bare of vegetation by the ants. Passage ways extend 30-36 inches below the surface. Carbon disulphide and calcium cyanamide are effective in killing the ants, and rotenone shows promise. 50-100 c.c. of methyl bromide injected 6-18 inches beneath the top of the mound killed 52% of the colonies in 25 mounds and retreatment eliminated most of the ants, although after a year ants from surrounding woods occupied some of the mounds. 16 oz. of paradichlorobenzene completely eliminated the ants, and smaller quantities reduced their activities. 2 applications of 20% DDT dust in pyrophyllite was ineffective. 0.8% DDT emulsion destroyed many ants and showed promise of being effective in repeated applications. 0.4% DDT emulsion was ineffective. Fuming with 400 c.c. of Dowfume G killed the colony. The most satisfactory control was by placing a complete barrier band of sodium fluoride around the periphery of the nest. One colony was eradicated by treatment with a fluorine compound containing sulphur.

[191] 632.7:632.951
JAMESON, H. R.; THOMAS, F. J. D. WOODWARD, R. C. **The practical control of wireworm by γ -benzene hexachloride ('Gammexane') : comparisons with dichlorodiphenyltrichlorethane (D.D.T.).** *Ann. Appl. Biol.* 34, 1947 (346-356). [Jealott's Hill Res. Sta., Bracknell, Berks.]

On land heavily infested with wireworms, benzene hexachloride (13% Gammexane) broadcast at 6 lb./acre or combine-drilled at 2 lb./acre increased grain yields of winter wheat and spring oats 2-5 fold. 5 oz./bushel of 8% Gammexane used as a seed dressing increased yield slightly less than when combine-drilled. Quality was better and more uniform after application by any of the three methods. Wireworm population was decreased to $\frac{1}{3}$ by broadcasting 3 cwt./acre, and to $\frac{1}{2}$ by combine-drilling 1 cwt./acre of 2% benzene hexachloride dust. Slightly less than the equivalent dose used in combine-drilling, if used as seed dressing reduced the population to $\frac{3}{4}$. 2-12 oz./acre of Gammexane

may be effectively broadcast, combine-drilled or applied on seed. D.D.T. gave less marked results and it is possible that the two chemicals differ in their action on wireworms.

[192] 632.7:632.953
ROBERTS, R. **Soil treatment to control *Blapstinus* wireworms.** *J. Econ. Ent.* 40, 1947 (571-572). [Expt. Sta., Weslaco, Texas]

0.575% γ benzene hexachloride mixed with the soil killed root-feeding larvae of *Blapstinus* wireworms. It retarded seedling growth and may kill plants if it is too concentrated. 25% DDT killed the wireworms more slowly and slightly burned the plants. Cryolite bait in which 40% cryolite was used with finely ground, dried citrus pulp as carrier killed very few wireworms.

[193] 632.8:631.81
SELMAN, I. W. **The influence of soil conditions on susceptibility to systemic infection of the tomato with viruses of the tobacco mosaic group.** *Cheshunt Expt. Res. Sta. Rept.* 1946, 1947 (35-36).

The susceptibility of tomato plants to systemic invasion by mosaic-inducing viruses was increased by excessive application of K_2SO_4 and of dried blood, the use of slaked lime in certain soil mixtures, and over-watering.

632.95 SOIL INSECTICIDES. FUNGICIDES. HERBICIDES

(See also Abs. No. 258)

[194] 632.951
LANGE, W. H. **New developments in soil insecticides.** *Agric. Chem.* 2, 1947 (20-23, 68, 69, 71). [Univ. Calif.]

200 lb./acre of 10% DDT powder was not as effective after 5 months on wireworms affecting lettuce as 2 lb. of 5% gamma isomer dust, and DDT in aromatic solvents drilled into the soil was ineffective. DDT may depress nodulation of legumes when applied to growing plants.

[195] 632.953
RICHARDSON, H. H.; JOHNSON, A. C.; BULGER, J. W., ET AL. **Studies of methyl**

bromide in greenhouse and vault fumigation. *U.S.D.A. Tech. Bull.* 853, 1943, pp. 20. *Ann. Agron.* 17, 1947 (492).

Methyl bromide acts on soil insects to a depth of 5 inches, or less when the soil is very moist. A greenhouse treated 10 times in a month showed no accumulation of toxic product.

[196] 632.953
NEWHALL, A. G. **Comparison of some volatile soil fumigants.** *Agric. Chem.* 2, 1947 (30, 31, 63). [Cornell Univ., Ithaca, N.Y.]

Chloropicrin is the most effective fumigant, especially against fungi, such as *Fusarium* and *Verticillium*, but high dosage is required against resting bodies as of *Sclerotinia* and *Botrytis*. 300-600 lb./acre is a common rate for nematode control in beds and bench soil.

Iscobrome and Dowfume G (15% and 10% methyl bromide) come second for general use, and are the only ones recommended for winter use in greenhouses where soil temperatures are below 65°F. and it is wished to replant in less than 10 days. The ordinary nematode rate of 15-30 lb./1000 square feet should be increased when the temperature is down to 55°. To destroy sclerotial resting bodies the rate should be 5 times the above, and the soil covered with a gas-proof material. They are less effective than chloropicrin against *Fusaria*. DD at 200-500 lb./acre effectively controls nematode and wireworms. Ethylene dibromide at 12 lbs. of 10% product/1000 square feet gives perfect control of eelworm and is the easiest and safest to handle of all, but like DD is not dependable with weed seeds and fungi. Both are suitable in summer or in soils at 70°, or which are not required for planting for 2-4 weeks.

In tomato greenhouses in New York State a summer treatment with chloropicrin followed in winter by methyl bromide is becoming popular. Radish and beet greens are suitable crops to follow, being shallow feeders and tolerant of small residues.

[197] 632.953
STARK, F. L., JR.; LEAR, B. **Miscellaneous greenhouse tests with various soil fumigants for the control of fungi and nematodes.** *Phytopath.* 37, 1947 (698-711). [Dept. Pl. Path., Cornell Univ., Ithaca, N.Y.]

Chloropicrin was the most effective fungicide of all the fumigants tested. DD mixture and methyl-bromide solutions were also fungicidal, but only at considerably higher dosages than were required for nematode control. Ethylene bromide was the most efficacious nematocide, followed by DD mixture, methyl-bromide solutions and chloropicrin in descending order of effectiveness. Methyl-bromide solutions and DD were effective regardless of the condition of the root galls, while for chloropicrin to be effective it was necessary to allow for decay of the root galls, and for the nematodes to develop to a susceptible stage. Small greenhouse tests are liable to cause over-estimation of the value of a compound, as in the field it is often impracticable to obtain the same degree of mixing as in a greenhouse.

[198] 632.954
EVANS, H. **Chemical weed control.** *Rev. Agric. Maurice* 26, 1947 (108-124).

History of the development of chemical weed-control, followed by a discussion on hormone weed-killers and their application under Mauritius conditions, and an attempt to forecast lines of future developments in chemical weed-killers.

[199] 632.954 : 577.17
BOURGEOIS, L. C. **2,4-D as a seed sterilizer.** *Amer. Soc. Sug. Cane Tech. Quart. Bull.* 3, No. 2, 1947. *Sugar* 42 (52).

It has been found that 2,4-D is capable of sterilizing weed seeds. In a field experiment on plots that had lain fallow for a year and were planted with cane in September, the lack of germination of grass on the plots sprayed with 2,4-D was remarkable as compared with the unsprayed plots which were covered in January with grass.

[200] 632.954 : 577.17
FULTS, J. L.; PAYNE, M. G. **A biometric evaluation of the growth-regulating and herbicidal properties of some organic compounds.** *J. Amer. Soc. Agron.* 39, 1947 (667-681). [Colo. Agric. Expt. Sta., Fort Collins]

Growth-regulating substances cause an inward curvature of the split ends of young pea stems (Went's pea test). The growth-regulating properties of 74 chemicals in a wide range of concentrations were determined

by a modification of this test and were classified, using the reaction of 2,4-D as the standard.

26 of these chemicals were studied for herbicidal action in experiments on castor beans, and are listed in order of activity.

The importance in such experiments of using a wide range of concentrations is stressed: compounds at one concentration are inferior and at another superior to 2,4-D. In selecting organic compounds for herbicidal properties similar to those of 2,4-D, a good procedure would be first to select compounds by the pea test, and then test the rejects by the castor-bean test.

[201] 632.954 : 577.17
HAMNER, C. L. ; LUCAS, E. H. ; SELL, H. M. **The effect of different acidity levels on the herbicidal action of the sodium salt of 2,4-dichlorophenoxyacetic acid.** *Mich. Agric. Expt. Sta. Quart. Bull.* 28, 1947 (337-342).

For large-scale use the Na salt appears the most suitable preparation. Its herbicidal action is greatly increased by application in an acid solution, the pH range of 2-3 of unbuffered solutions giving optimum results if sufficiently strong acids are used. The amount of titratable acid (within its non-injurious range) rather than the pH value of a solution accounts for the increased effect.

[202] 632.954 : 577.17
HITCHCOCK, A. E. ; ZIMMERMAN, P. W. **Response and recovery of dandelion and plantain after treatment with 2,4-D.** *Boyce Thompson Inst. Contr.* 14, 1947 (471-492).

A single treatment with 0.1% 2,4-D eradicated narrow-leaved plantain and 2 species of broad-leaved plantain with little or no recovery up to April of the following spring. Above-ground parts of dandelion were readily killed with one application of 2,4-D, but plants recovered the same year even with applications of 1 gallon per 90 square feet with concentrations of up to 1.0% and respraying 1-3 weeks after initial treatment. July treatments were as effective as spring and autumn treatments. The ineffectiveness of 2,4-D for killing dandelion tops in a wet, poorly drained lawn indicates that soil conditions may be an important limiting factor for the effectiveness of 2,4-D in killing other species.

[203] 632.954 : 577.17
KEPHART, L. W. **Technical and commercial aspects of 2,4-D.** *Agric. Chem.* 2, 1947 (25-27, 59, 61).

Mainly an appreciation of the market outlook for 2,4-D. 2,4-D can be spread on the soil immediately after planting maize, without injuring the cereal and with elimination of most of the weeds, and has proved useful in reducing heavy stands of weeds, willows, etc., which impede maintenance of irrigation and drainage ditches.

[204] 632.954 : 577.17
MEADLY, G. R. W. **Recent trials with selective weed killers.** *J. Dept. Agric. W. Aust.* 24, 1947 (55-63).

10 lb. of Dinoc or Sinoc (sodium dinitro-orthocresylate) + 2 lb. of $(\text{NH}_4)_2\text{SO}_4$ per 100 galls. at 100 gallons/acre is ineffective against rapistrum weed (*Rapistrum rugosum*), but completely controls double gee (*Emex australis*) in the seedling stage only. Annual clovers and capeweed (*Cryptostemma calendulaceum*) are controlled, but at later stages of growth require larger concentrations and applications.

Methoxone (2-methyl-4 chlorophenoxyacetic acid) and Di-weed (2,4-D) control rapistrum weed at the 2-4-inch rosette stage and prevent seeding if applied at the start of flowering. They control flat weed (*Hypochoeris* spp.) at 100 gallons/acre of 0.4% solution, but are less effective than Dinoc on the other weeds mentioned.

Grasses, except bents (*Agrostis* spp.) were in general unaffected by either type. Cost of application in W. Australia limits their use to areas of golf-links size and experimental plots, on which the alternative would be hand weeding.

[205] 632.954 : 577.17 : 633.61 : 633.73
VAN OVERBEEK, J. ; VÉLEZ, I. **Use of 2,4-dichlorophenoxyacetic acid as selective herbicide in the tropics.** *Science* 103, 1946 (472-473). B.A. BIII. 1947 (107).

In concentrations up to 0.3%, 2,4-D has no effect on sugarcane or coffee.

[206] 632.954 : 631.589
BARR, H. T. **Flame cultivation.** *La. Agric. Expt. Sta. Bull.* 415, 1947, pp. 15.

Instructions are given for killing weeds in row crops, particularly cotton and sugar

cane, by flaming, using propane, isobutane and butane. Implements are described. Flaming and cultivation can be done simultaneously and hand hoeing can be eliminated.

633.I CEREALS

(See also Abs. Nos. 41, 62, 120, 159, 181, 203, 366, 376, 388)

[207] 633.I-1.84:581.192
TERLIKOWSKI, F. Późne dawki azotu jako czynnik wzmagający produkcję białka w roślinach. [Late applications of nitrogen as a factor of increased production of protein in plants.] *Rocz. Nauk Roln.* 49, 1947 (382-402). [Pl.e.] [Univ. Poznań]

A review is given of the work of Selke and others in Germany from 1934 onwards which showed that under certain conditions applications of N fertilizer to cereals at the time of flowering led to appreciable increases in the percentage of N in the ripe grain. Such late applications of N achieved the desired result only if soil-moisture conditions were satisfactory, or when rain immediately preceded or followed the application of N.

Field trials were made in 1942 on loamy soils at four places where meteorological conditions were on the whole satisfactory. All plots received basal NPK manuring before sowing, and N as calcium nitrate was applied by hand at rates of 20 and 40 kg. of N per hectare at about flowering time. N percentages in grain and yields of grain and protein are recorded for 18 crops of winter and spring wheat, spring barley and oats. For all three cereals an increase in mean N percentage in the grain, or in yield of grain, or both, was observed from either rate of application of late N, but an advantage from the larger dose as compared with the smaller was doubtful. Late applications of N retarded ripening by 1-2 days. One set of winter-wheat plots where the yields, but not the percentages of N, were increased by late N applications was attacked by rust, most severely on the plots receiving late N. It is concluded that late application of N to cereals holds promise of being successful under Polish conditions.

A series of pot experiments with wheat, barley and oats was made. N as NaNO_3 was applied to some pots at flowering. All pots received a basal NPK dressing before

sowing: N as NH_4NO_3 , P as $\text{Ca}(\text{HPO}_4)_2$, and K as KCl or K_2SO_4 . Differences in yield or N percentage in the grain were small, though the differences in the comparison sulphate-chloride favoured the idea that basal manuring with sulphate slightly retarded the translocation of protein from straw to grain. This point does not appear to have been investigated by the German workers, though they have examined the effects of late applications of KCl or K_2SO_4 .

The apparently academic point may acquire practical importance from the fact that in practice the use of super. and $(\text{NH}_4)_2\text{SO}_4$ supplies large amounts of SO_4 , irrespective of the form of K used. The paper concludes with speculation whether the late-season nitrogenous metabolism of leguminous plants may not be considered as a kind of autogenous series of late-N applications, to which these plants are inherently adapted, and derived from the continuing activity of their symbiotic bacteria.—R.N.

[208] 633.II-1.43
HUANG, H. S. [Effect of soil depth on the yield of wheat.] *Soils Quart.* 5, 1946 (183-186). [Ch.]

[209] 633.II-1.84-1.816.2
RANKIN, W. H. Effect of nitrogen supplied at various stages of growth on the development of the wheat plant. *Proc. Soil Sci. Amer.* 1946, 11, 1947 (384-387). [N.C. Agric. Expt. Sta., Raleigh]

The usual method of applying N to wheat is to top-dress in the spring about the time when growth begins. Field experiments showed that the amount of N taken up by wheat was influenced by the stage of growth of the wheat plants at the time when N was supplied. Applying small amounts of N at intervals as the wheat developed produced a higher yield of grain (35 bushels per acre) than an application of the whole amount at seeding (23 bushels per acre). As the wheat was sown in the autumn it is suggested that a portion of the N supplied at seeding was leached before the plants were at a stage to utilize it. Not only the yield, but also the number of kernels per foot of drill row and the weight of the kernels were affected by the stage of growth of the wheat when the N was supplied.

[210] 633.13-1.84
NELSON, L. B. ; MELDRUM, H. R. ; PIERRE, W. H. **Nitrogen fertilization of oats and its relation to other crops in the rotation.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (417-421). [Iowa Agric. Expt. Sta.]

A common rotation in the Corn Belt is two years of maize followed by a legume-grass seeding with oats as a nurse crop. The oat yield is usually poor, owing to the drain on soil N caused by the maize. Attempts have been made to improve the profitability of the oat crop by fertilizing. On most fields oats gave a good response to N, the rate of N application affecting the efficiency of its utilization. 20 lb. of N per acre was the most efficient and profitable application for most fields and the one that did not materially affect the yields of the following hay crop. The oat response obtained from an N fertilizer was greatly affected by previous cropping practice. The largest increases were obtained when oats were separated from clover by two years or more of a non-legume, only half this increase resulting when oats were separated from clover by only one year of a non-legume. On fields where large responses to P were obtained, omission of P fertilizer greatly reduced the efficiency of N fertilizers. On fields showing slight or no response to P, omission of P did not affect the efficiency of N. A similar relationship occurs with K.

[211] 633.13-2.III-1.85
AMERICAN FERTILIZER. **Fertilizer makes oats hardy.** *Amer. Fert.* 107, No. 5, 1947 (12).

Oats fertilized with super. in autumn will stand several degrees lower temperature and will mature earlier than unfertilized oats. For hay or grain, 300 lb./acre of super. on soils of medium productivity and 300 lb./acre of 4-16-0 or 3-12-6 on soils of low productivity is recommended. For grazing, 300 lb./acre of 4-16-0 or 4-12-4 is suitable.

[212] 633.13-2.19 : 546.56
HARRIS, H. C. **A nutritional disease of oats apparently due to lack of copper.** *Science* 106, 1947 (398). [Fla. Agric. Expt. Sta., Gainesville]

Field experiments were made on soil on which 2-month-old oat plants were small and showed marginal chlorosis of leaves.

A uniform liberal application of N, P, K, Ca, Mg, S, Cu, Zn, Mn, B and Mo was made to the soil in all possible combinations before seeding oats. Cu was applied as 10 lb./acre of CuCl_2 . Oats that received no Cu developed severe symptoms, but oats grown on every Cu-treated plot were free of disease. The only element of value was Cu. Top-dressing with extra NaNO_3 accentuated the trouble. CuCl_2 and CuSO_4 had a pronounced residual effect.

[213] 633.15-1.51
WEIDEMANN, A. G. **The why and how in cultivating corn.** *Mich. Agric. Expt. Sta. Quart. Bull.* 29, 1947 (320-326).

Experiments on Hillsdale sandy loam showed no striking differences between the results of weed removal by cultivation and by shaving off at the surface with a sharp hoe. Cultivation should be only frequent enough and deep enough to control weeds without seriously pruning the crop roots.

[214] 633.15-1.54-1.811
SEEM, B. L. ; HUBER, L. L. **Corn planting rates, soil productivity, and yield.** *Pa. Agric. Expt. Sta. Bull.* 480, Supp. 3, 1947 (7-8).

With adequate rainfall, soil fertility largely determines maize yield, provided the planting rate is adjusted to the soil's fertility level. In experiments using 150 lb./acre of 10-10-10 fertilizer at planting time, the highest yield was obtained with 11,000 plants per acre. When the numbers were increased to 16,000 plants per acre the yield of plots receiving an additional 600 lb. of 10-10-10 fertilizer broadcast increased considerably, but that of plots receiving only 150 lb. at planting time decreased.

The weight of ear may be used as an index to determine an adequate number of plants per acre for any level of soil productivity. Increasing the number of stalks decreases the weight of ear per stalk, but increases the yield until the ear weight per stalk is reduced to approximately 0.6 lb. Additional increase in the number of stalks reduces the yield per acre. An average ear weight per stalk at harvest above 0.6 lb. suggests a plant population too low for maximum yields, and an average weight below 0.6 lb. indicates a plant population too high for best results. For every 0.1 lb. of ear weight above 0.6 lb.

the plant population should be increased by 2000 plants/acre; for every 0.1 lb. below 0.6 lb. it should be reduced by 1000 plants/acre. Plant populations of 15,000 per acre should rarely be exceeded. A soil with sufficient productivity to support 15,000 maize plants per acre will usually not produce an economic return from broadcast fertilizer in addition to row application.

[215] 633.15-1.816.3
MACGREGOR, J. M. **Fertilizer placement for corn on sandy soils of Minnesota.** *Better Crops* 31, 1947 (16-19, 46-47). [Div. Soils, Univ. Minn., St. Paul]

Three years of investigation using commercial fertilizers at rates up to 1000 lb./acre on several finer-textured soil types of the corn belt in southwestern Minnesota demonstrated that in years of average precipitation placement was probably not superior to fertilizing in the hill. The average yields of ear maize for four different counties was 27.1 bu./acre. for hill-dropped fertilizer and 28.2 bu./acre for ploughed-under fertilizer. Fodder gave an average of 1.17 tons/acre and 1.16 tons/acre for hill-dropped and ploughed-under fertilizer respectively.

[216] 633.15-1.84
AMERICAN FERTILIZER. **More nitrogen and thicker spacing doubles and triples corn yields.** *Amer. Fert.* 107, No. 5, 1947 (12).

At the Mississippi Experiment Station, by raising the N application to 120 lb./acre as a maximum, of which 30 lb. were applied at planting time and the remainder as a side dressing when the maize was knee high, and raising the P_2O_5 and K_2O rates to 80 lb./acre, stands of 12,000 plants per acre grew well and gave an increase in yield of 1 bushel for each 2 lb. of N added. 90 lb. of N and 10,000 plants per acre were a satisfactory combination. Weed control early in the season and avoidance of deep or late cultivation are advised. There was less weed growth in well fertilized, heavy stands than in the usual stands and less cultivation was needed.

[217] 633.15-2.7-2.953
SCOTT, L. B. **Control of the maize root-worm.** *J. Econ. Ent.* 39, 1946 (402). B.A. BIII. 1947 (92).

A 3% DDT pyrophyllite dust gave almost complete control within 24 hours. A 10% dust controlled the beetles within an hour.

[218] 633.18-1.811.91
CHAKLADER, M. N. **Influence of soil moisture on the yield of paddy.** *Indian J. Agric. Sci.* 6, 1946 (152-157). [Dept. Agric., Bengal]

Pot experiments were made in which soil moisture was kept at 75, 50 and 33% of maximum saturation capacity and the pots were watered at intervals of 3, 6, 9, etc. days up to 21 days. (In some parts of the text the intervals are given as every 4th, 7th, 10th....22nd day.) In the early stages of growth the plants were not much affected by the length of the watering interval. At the two higher soil-moisture levels the highest number of seed-forming tillers was produced by the shortest watering interval, the number declining as the interval increased. At the 33% level no seed was formed even with a 3-day watering interval. Total numbers of tillers also declined with increasing watering interval except that the highest number of tillers at 75% moisture saturation was formed with a six- (or seven-) day watering interval.

[219] 633.18-2.4-1.811
CRALLEY, E. M. **Rice nutrition in relation to stem rot of rice.** *Better Crops* 31, No. 4, 1947 (13-14, 43). C.A. 41 (6009). [Ark. Agric. Expt. Sta., Fayetteville]

High N increases and high K decreases susceptibility of rice to stem rot.

633.2/3 GRASSES. LEGUMES

(See also Abs. Nos. 5, 30, 121, 170, 185)

[220] 633.2 03-1.417
MCHENRY, J. R.; ALEXANDER, L. T.; ZOOK, L. L. **Carbon and nitrogen contents of a chernozem soil as affected by age of perennial grass sods.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (407-412). [Neb. Agric. Expt. Sta.]

In plots which had been in grass for more than 6 out of 9 years the total-N and organic-C contents were greater than in plots under continuous cultivation.

[221] 633.2.03-1.43 : 551.48
ALDERFER, R. B.; ROBINSON, R. R. **Runoff from pastures in relation to grazing intensity and soil compaction.** *J. Amer. Soc. Agron.* 39, 1947 (948-958).

A type-F rainfall simulator was used to determine runoff losses from various sites. Measurements of water losses were supplemented by measurements of vegetative cover, percentage slope, volume weight, capillary and non-capillary porosity, organic-matter content, pH and the mechanical analysis of the soil. In general, water losses were high from heavily grazed pastures, whereas ungrazed areas lost little if any water by runoff.

Runoff was highly correlated with non-capillary porosity, the correlation coefficient for this relationship being 0.76. The greatest difference between grazed and ungrazed soils occurs within the 0 to 1-inch layer, the compacting effect of cattle trampling being most pronounced in the first inch of surface soil.

[222] 633.2.03-1.544.7
VOGLER, E. Entretien des prairies et pâturages. [The maintenance of meadows and pastures.] *Potasse* 21, 1947 (175-177). [F.]

Summer-burnt, severely grazed grassland should be covered evenly before the cold weather with old straw, compost, manure or potato haulms to assist recovery and quick growth in spring. It is recommended to add 300 kg. of slag/ha. and 400 kg. of sylvinit/ha. in late autumn, together with N, preferably as liquid manure. On severely damaged parts, grasses and legumes may be sown in early spring, after an autumn harrowing or discing.

[223] 633.2.03-1.81 : 581.192
ØDELIEN, M. Orienterende forsøk med store kunstgjødselmengder til eng på Østlandet. [Preliminary experiments with heavy applications of artificial fertilizers to temporary hay in south-east Norway.] *Meld. Norg. LandbrHøgsk.* 27, 1947 (85-154). [N.e.]

Large increases in hay yields were obtained by application of a complete fertilizer containing 15% N, 12% P_2O_5 and 19.5% K. The increases were larger the greater the proportion of grasses and the lower the proportion of clovers. Digestion experiments indicated that fertilizers increased the digestion coefficients for crude protein at the first cutting and decreased them at the second cutting. Fertilizers reduced the digestibility of the N-free extracts for both crops.

[224] 633.2.03-1.81 : 581.192
SHERWOOD, F. W.; HALVERSON J. O.; WOODHOUSE, W. W., ET AL. Effect of fertilization on the nitrogen, calcium, and phosphorus contents of pasture herbage. *J. Amer. Soc. Agron.* 39, 1947 (841-858). [N.C. Agric. Expt. Sta.]

Both limestone and P stimulated the growth of Kentucky bluegrass. Lespedeza responded more to limestone, and white clover more to P. Limestone and P did not show any significant interaction. Their effect on the N content of herbage varied from year to year, but the Ca content was not affected by either, and the P content was increased only by one P fertilizer.

[225] 633.2.03-1.811.2/3
MCCOOL, M. M. Availability of phosphorus and potassium of some soil types devoted to pastures in New York. *Boyce Thompson Inst. Contr.* 14, 1947 (411-417).

Growth tests with rye grass showed that with one exception there was a deficiency of available P in acid soils of pH 4.6-6.2 devoted to pastures. The yield of white clover was increased by the addition of super. Rye grass did not respond to the addition of K to the soils, but the yield of white clover was increased on one soil when K was added. Yields of rye and orchard grasses were higher than those of other grasses on soils low in readily available P.

[226] 633.2.03-1.811.9
HODGES, E. M.; KILLINGER, G. B.; CARRIGAN, R. A. Effect of minor elements on the establishment and growth of pasture plants. *Fla. Agric. Expt. Sta. Ann. Rept.* 1945 (131-132).

With carpet, common Bahia, and Pangola grasses Mn gave no yield increase over the plots receiving no trace elements; Zn gave increases of 0-160%, varying with the type of grass; Cu, 0-128%; Mn+Cu+Zn, 53-325%—the addition of B+Mg+Fe+Co changing these figures to 87-247%. With legumes, Cu+Zn+B+Mn gave an increase, of 57% raised to 83% by addition of Ca, P and K.

With oats, 17 kg. of $CuSO_4$ /acre completely remedied deficiency symptoms on a fine-sand soil with considerable humus.

[227] 633.2.03-2.19-1.416
DUNLOP, G. **Nutritional variation of soils and pastures on Scottish hill grazings.** *Brit. J. Nutrit.* 1, No. 1, 1947 (iv).

On Scottish hill grazings, two or more different soils with different mineral contents may be found within the area grazed by one heft of sheep. While a composite sample from the whole area may indicate a mineral-rich pasture with no deficiency, a number of animals grazing mainly on one portion may show deficiency symptoms.

[228] 633.28-1.81
BULLETIN OF THE IMPERIAL INSTITUTE.
Investigation work of the Agricultural Department, Antigua. *Bull. Imp. Inst.* 45, 1947 (25-26).

The use of 2 cwt./acre of NH_4NO_3 soon after establishment gave an increase of 23% in the yield of Guinea grass, 12% of elephant grass and 6% of Guatemala grass and Uba cane. Elephant grass and Guinea grass showed no response to phosphates when applied alone.

[229] 633.287-1.61
RATTRAY, J. M. **Giant Rhodes grass pastures at Trelawney.** *Rhod. Agric. J.* 44, 1947 (259-263).

It is considered by the growers that Giant Rhodes grass has a great part to play in the future of sandveld farming, as it is extremely effective against soil erosion; it should have a good effect on water supplies as it holds up excessive rain, allowing it to penetrate into the soil. Its root system is excellent and should therefore improve soil structure and aeration. It is easily killed by ploughing in the dry season, so that there is no danger of its becoming a nuisance. Details of planting, fertilizing and grazing treatments are given.

[230] 633.321 : 633.1
WEIDEMANN, A. G. **Value of red clover in a rotation.** *Mich. Agric. Expt. Sta. Quart. Bull.* 29, 1947 (294-296).

Yields of corn and barley were substantially greater under the rotation corn-barley-wheat-red clover than under that of corn-barley-wheat, even though the clover failed in 3 out of the 11 years of the experiment. The yearly average production of clover hay was 1809 lb./acre, the second crop

always being ploughed under in spring for corn. As all plots were unfertilized, yields with normal K and P fertilizing of the clover would have been still greater.

[231] 633.33-1.5
PENNY, N. M. **Production and marketing of cowpeas for canning.** *Ga. Expt. Sta. Bull.* 252, 1946, pp. 22.

Includes a description of production practices for early and late cowpeas in a cotton-growing area. Use of fertilizers for this crop is uncommon; a few farms use about 2 cwt./acre of commercial mixed fertilizers or acid phosphate. The effect of cowpeas on soil building and conservation alone is probably worth the growing cost in most cases.

[232] 633.34-1.81 : 581.192
FULEKY, G. **[The protein and oil content of soybean artificially fertilized.]** *Kisérlet. Közlem.* 46, 1943 (304). *Biol. Abs.* 21 (1488).

P fertilizer increased the protein content. Borates influenced both purified and raw protein content and also the amount of ash.

[233] 633.34-2.19 : 546.711
STECKEL, J. E. **Manganese fertilization of soybeans in Indiana.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (345-348). [Purdue Univ. Agric. Expt. Sta.]

A preliminary survey of Mn deficiency of soybeans in Northern Indiana showed that the deficiency was found on soils with a pH of 6.5 or higher, with high organic-matter content and with naturally high water tables. It was prevalent in soils of glacial outwash and lake-bed origin and on depressional soils of heavy parent material. Commercial MnSO_4 was effective at all rates of application up to 568 lb. of MnSO_4 per acre in increasing soybean plant weight, the Mn content and the yield of soybeans. The most effective rate of application was 142 lb. of Mn as MnSO_4 . Mn uptake in soybean plants was greater where MnSO_4 was applied with a complete fertilizer than where applied alone.

633.4 ROOT CROPS

[234] 633.4-1.421
NISSEN, O. **Om nabovirkning i rotvekst-forsøkene.** [The interaction between

neighbouring plots in root experiments.]
Meld. Norg. LandbrHøgsk. 27, 1947 (155-164).
 [N.e.]

When different root crops—turnips, swedes and beet—were grown on neighbouring plots in field experiments, interaction between the species used could be considerable and such experiments ought therefore to be provided with separating border rows between plots. In an experiment on three large fields the interaction between different strains of beet was studied. The plots consisted of three rows and the interaction was expressed as difference in yields of the outer rows and the middle row in each plot. This difference was found to be not significant and purely accidental, although it is possible that the highest-yielding strains with the largest crops of leaves may exert some depressing effect on neighbouring strains. If, however, data of yields from previous years are available and the varieties are arranged according to their leaf crops, it is not possible to show a definite direction of interaction. The author found no practical advantage in arranging the strains in rows according to previous years' performance.—S.H.

[235] 633-42-1.5
 BEGGS, J. P. **Production and management of the rape crop.** *N.Z. J. Agric. 75, 1947 (289-293).*

Rape (*Brassica napus*) grows most satisfactorily on rich, friable, well-drained loams. It may be grown anywhere in the rotation, but thrives best after pasture and is a good crop to precede a cereal. It is a good cleaning crop on weedy paddocks. P is the chief fertilizer required, but super. has a detrimental effect on seed germination, and if more than 1 cwt./acre is used CaCO_3 should be mixed with it in equal proportions. In drier regions not more than 2 cwt./acre should be used. Blood-and-bone manure mixed with super. in equal proportions is recommended.

[236] 633-491-1.41: 581.192
 SCHÖNFELD, S. [The effect of soil conditions and artificial fertilizers on the quantity and quality of potato yields.] *Kisérlet. Közlem. 46, 1943 (63). Biol. Abs. 21 (1499).*

Yields and quality of potatoes were best on unlimed acid soils, next best on limed acid soils and poorest on calcareous soils. Slightly acid soil reactions favour potato production more than neutral or alkaline reactions. Starch percentage of potatoes grown on acid soils was lower than that from calcareous soils and substantially lower than from limed soils. N fertilizers alone or combined in a complete fertilizer favourably affected quantity and percentage of starch in potatoes grown on acid soils. On calcareous and limed soils, this response from N was reversed. Super. and K_2O were generally less effective alone than when combined with N.

[237] 633-491-1.5
 WERNER, H. O. **Commercial potato production in Nebraska.** *Neb. Agric. Expt. Sta. Bull. 384, 1947, pp. 173.*

Potatoes require sandy loam soil, porous enough to absorb water readily and yet well drained and aerated. An interval of 3-4 years between potato crops is necessary. Fertility is maintained in an irrigated rotation including lucerne or sweet clover with manure ploughed under once or twice in each 6-year rotation. The growing of a number of lucerne crops for hay may produce P deficiency. Shortage of P is most likely to occur on calcareous soils and can be remedied with 100-150 lb./acre of 45% super. broadcast before ploughing or applied in narrow bands on each side of the row. On dry-land soils, the application of fertilizer may stimulate vegetative growth beyond the carrying capacity of the low summer rainfall.

[238] 633-491-1.811
 LORENZ, O. A. **Studies on potato nutrition. III. Chemical composition and uptake of nutrients by Kern County potatoes.** *Amer. Potato J. 24, 1947 (281-293).* [Div. Truck Crops, Univ. Calif. Coll. Agric, Davis]

The greatest intensity of nutrient absorption occurred between about 75 and 110 days after planting, or 45 to 80 days after plant emergence. An unfertilized crop of potatoes grown in 1945 and producing 119 sacks contained 59 lb. of N, 17 lb. of P_2O_5 and 126 lb. of K_2O per acre. The tubers alone removed 33 lb. of N, 14 of P_2O_5 and 79 of K_2O . The highest-yielding treatment which

in 1946 produced 395 sacks per acre, absorbed 139 lb. of N, 26 of P_2O_5 and 253 of K_2O . The tubers alone removed 106 lb. of N, 31 of P_2O_5 and 196 of K_2O .

[239] 633.491-1.821.1
WALLACE, T. ; DAVIES, W. M. ; NICHOLAS, D. J. D., ET AL. **Some effects of lime and fertilizers on potatoes on a strongly acid soil as determined by visual symptoms and chemical tests.** *Long Ashton Agric. Hort. Res. Sta. Rept. 1946* (61-66).

On a soil reclaimed from heath conditions, liming corrected Ca deficiency and Mn toxicity for the potato crop, but further treatment with fertilizers was necessary to obtain appreciable crops.

Visual symptoms and the results of chemical analyses and tissue tests showed good agreement on the mineral status of the plants under different treatments. It is suggested that a combination of the three methods will be valuable in examining problems of crop production on acid soils.

[240] 633.491-2.19-1.415.3
BLODGETT, E. C. ; SNYDER, R. S. **Effect of alkali salts on shape and appearance of Russet Burbank potatoes.** *Amer. Potato J.* 23, 1946 (425-430). *Biol. Abs.* 21 (1497). [*Agric. Expt. Sta., Moscow, Idaho*]

Greenhouse and field tests showed that certified seed stock of the Russet Burbank variety when grown in soils of high saline content produced off-type tubers with smooth skins and that soils from the same locality upon which good potatoes were growing produced similar off-type potatoes when these soils were treated with equivalent amounts of Na_2SO_4 and chloride salts.

[241] 633.491-2.4-2.953
GÉNÈREUX, H. Désinfection du sol dans le but de lutter contre la gale commune des pommes de terres. [**Soil disinfection with a view to controlling common scab of potatoes.**] *Rept. Quebec Soc. Prot. Pl.* 1943-1944 (89-93). *R.A.M.* 26 (414).

Infection of potatoes with *Actinomyces scabies* was heavy in well-drained soils, in grey soils, in light soils, in soils containing free lime and in soils in which fresh horse dung was used ; it was slight in soils with pH below 5.5. In experiments on 44 fields from 1937 to 1942 soil disinfection with

mercury compounds and S was satisfactory during the first 3 years and less so during the second 3 years. In some soils the mercury compounds favoured infection, S gave promising results, but sometimes reduced yields, 2.5, 5 and 10 lb./acre of yellow mercuric oxide, 5-10 lb. of mercurous chloride and 750 lb. of S were applied just before planting. Average yields for 1937-1939 and 1940-1942 were, respectively, untreated control 81.2 and 81.4, mercuric oxide + 5 lb. of celite 118.1 and 88.2, mercurous chloride + fertilizer 130.9 and 83.7, sulphur 108.8 and 92.9.

Laboratory tests showed that mercury compounds become reduced in soils to metallic mercury which passes through the soil by diffusion in a volatile form ; hence, any factor impeding the reduction of mercury compounds would arrest the action of the mercury. Strongly alkaline soils treated with 5 lb./acre of mercurous chloride and the same + S averaged 1.79 and 1.11% scab as against 5.5% in the untreated control, indicating that acidity-promoting conditions reduce scab in the presence of mercury compounds.

633.5 FIBRE PLANTS

(See also Abs. Nos. 138, 166)

[242] 633.51 : 546.56
GAINES, J. C. **Comparison of insecticides for cotton insect control and the effect of copper on yields.** *J. Econ. Ent.* 40, 1947 (434-435). [*College Sta., Texas*]

Basic copper arsenate is effective against bollworm. In experiments copper and lead arsenate were applied to cotton as dust and 3.3 lb./acre of $CuSO_4$ were applied to the soil as a side dressing when plants were in the seedling stage. Basic copper arsenate gave better control and higher yields than the other treatments. It was concluded that this might be due partly to the stimulating effect of Cu on the plant, but Cu applied to the soil increased the yield by only 5%.

[243] 633.51-1.415.1 : 581.192
PADEN, W. R. ; GARMAN, W. H. **Yield and composition of cotton and Kobe lespedeza grown at different pH levels.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (309-316). [*S.C. Agric. Expt. Sta.*]

For cotton the milliequivalent sum of K, Na, Ca and Mg was 18.4% less for plants grown at pH 6.5 as compared with those grown at pH 5.0. For lespedeza hay the m.e. sum of these elements was lower at pH 6.5 than at the three more acid soil reactions pH 5.0, 5.5 and 6.0. The yields of both cotton and lespedeza increased with the pH.

[244] 633.51-2.4-1.81
GARRETT, S. D. Report on an investigation of *Verticillium* wilt. *Emp. Cott. Grow. Rev.* 24, 1947 (101-102). [Rothamsted]

Prospects for controlling *Verticillium* wilt are poor. Soil conditions have little direct influence on the spread of the disease, but they influence the progress of the disease indirectly through their effect on the physiology of the host plant. Infection is favoured by a high level of nutrition in the host plant, especially by N, and manurial treatment is useless in combating the disease. An attempt to offset the effect of N by high K manuring has given negative results.

[245] 633.51-2.7-1.81
DUCKER, H. C. Possibilities of increased cotton production in East Africa. 5. Nyasaland and increased cotton production. *Emp. Cott. Grow. Rev.* 24, 1947 (239-244).

Fertility adjustments by the use of inorganic manure will do nothing to defeat entomological pests of cotton, even though on some of the poorer land they might make for better plant development. This would provide more food and more opportunity for bollworm to multiply, in the absence of effective pest control measures.

[246] 633.52-1.5
WRIGHT, J. D. Linseed and linen flax. *N.Z. J. Agric.* 75, 1947 (128).

Notes on cultivation on the arable lands of South Island. Linen flax should not be grown on sites which lie away from the sun, or immediately after a fed-off crop, as the excess of N left in the soil after such a crop is not conducive to good-quality fibre.

[247] 633.52-1.811 : 581.192
EGGERS, V. Influence of carbohydrate and nitrate-nitrogen nutrition on development of hypocotyledonary buds in flax. *Bot. Gaz.* 107, 1946 (385-390). B.A. AIII 1947 (283).

Maximum bud production was associated with high carbohydrate—high N plants and minimum budding with high carbohydrate—low N plants.

[248] 633.522-1.582
VESSEL, A. J.; BLACK, C. A. Soil type and soil management factors in hemp production. *Iowa Agric. Expt. Sta. Res. Bull.* 352, 1947 (383-424).

Yield of hemp varied with the amount of available N in the soil, and the effect of the preceding crop was marked. Following alfalfa or clover the relative yield was 100, following soybeans 75, following oats or corn 57 and following sorghum 35. The residual effect of alfalfa on hemp lasted for 3 years, that of clover for 2 years and of soybeans for only 1 year. Yields of maize and hemp were higher following hemp than following maize or oats. Yields were slightly higher when the seed was drilled than when it was broadcast.

[249] 633.522-1.81 : 581.192
HESSLER, L. E. The effect of fertilizers on the chemical composition and quality of dew-retted hemp fiber. *J. Amer. Soc. Agron.* 39, 1947 (812-816) [Div. Cotton, Bur. Pl. Indust., U.S.D.A.]

The main factors determining the quality of hemp fibre are variety, cultural conditions and retting. Plant size may be controlled in normal years by choosing a not too fertile soil or by fertilizer treatment. Size can also be controlled by the seeding rate, as a heavy rate tends to hold down growth. A too productive soil such as that of old grassland generally produces coarse fibre of low strength and with a high protein content. N fertilizers increase the growth of hemp and give greater yields of dew-retted hemp fibre, but lower the quality because the fibre is coarser and weaker. The same applies to a soil high in N. Dew retting produces fibre remarkably uniform in composition regardless of fertilizer treatment.

[250] 633.524.3-1.4-1.874
CRANE, J. C. Kenaf—fibre-plant rival of jute. *Econ. Bot.* 1, 1947 (334-350). [Univ. Calif.]

Well drained, neutral, sandy loam soils, rich in humus, are best for kenaf (*Hibiscus cannabinus* L.). On poorly drained soils the

plant is stunted and on light sandy soils the fibre yield is low. Hard pan layers near the surface should be avoided, as the tap root penetrates fairly deep in the soil. Kenaf is very susceptible to attack by nematodes. *Crotalaria* and *Mimosa invisa* are recommended as green-manure crops. Increase in yield of 50% has resulted from the use of *M. invisa* and 1300 lb./ha. of $(\text{NH}_4)_2\text{SO}_4$.

[251] 633.526.1-1.4
MARSH, T. D. **Manila hemp** (*Musa textilis*). *Malay Agric. J.* 30, 1947 (123-129).

Manila hemp has been cultivated in Malaya under experimental conditions only. The climate is suitable. Soils for hemp production in the Philippines and in British North Borneo are referred to as 10-cwt., 15-cwt., or 1-ton soils, these being the probable yields of fibre per acre per annum. 10 cwt. of fibre per annum only covers the cost of production. In Malaya the higher amounts are only likely to be produced on the most fertile soils. Although heavy clay soils are in general not recommended, the crop has been successfully grown experimentally on coastal alluvial soils. The best soils for the growth of Manila hemp are volcanic or rich alluvial. Details of planting and cultivation are given.

633.6 SUGAR CROPS

(See also Abs. No. 379)

[252] 633.61-1.81
BLACKBURN, F. H. B. **Manurial trials with sugar cane in Barbados**. *Barbados Dept. Sci. Agric. Bull.* 7, 1946, pp. 18.

Comparison of (1) the effect of N, K and P on the yield of cane and per cent of sucrose in juice, (2) effects of (a) KNO_3 , (b) KCl plus $(\text{NH}_4)_2\text{SO}_4$, (c) KCl plus NaNO_3 on the yield of ratoon canes, (3) effect of N, K and ground limestone on yield of cane and per cent of sucrose in juice, 1937-1939.

[253] 633.61-1.81
AMERICAN FERTILIZER. **Sugar cane responds to complete fertilizer**. *Amer. Fert.* 107, No. 6, 1947 (19-20).

In Louisiana, 60 lb./acre of N, 25 lb./acre of P_2O_5 and 40 lb. of K_2O gave an increase in yield of 1530 lb. of sugar per acre.

[254] 633.61-2.51
CRAIG, N.; EVANS, H. **Preliminary reports on the progress of weed control investigations in Mauritius**. Part II. *Mikania scandens*, known in Mauritius as "Liane Margoze," "Liane Pauline" and "Liane Raisin." Part III. *Artemisia vulgaris* known locally as "Brède Chinois," "Armoise" or "Herbe du Vin" and "*Ambrosia artemisifolia*" known locally as "Herbe Solférino." *Rev. Agric. Maurice* 25, 1946 (198-210).

Spraying with 5% sodium chlorate effectively controlled *Mikania scandens* and had no injurious effect on sugar cane.

Two sprayings with 10% sodium chlorate at 100 gallons per arpent gave about 98% kill of *Artemisia vulgaris* rhizomes. Spraying "Herbe Solférino" with 0.25% Methoxone at 150-200 gallons per arpent gave 90 to 100% control.

[255] 633.61-2.51
EVANS, H. **Results of some preliminary investigations on the control of weeds in Mauritius**. Part VI. Some twining weeds: *Paederia foetida* ("Liane lingue," "Liane K.K."), *Ipomoea cairica* ("Liane lastique"), *Asystasia gangetica* ("Liane or Herbe pistache" or "Herbe piment"), *Thunbergia fragrans* ("Liane blanche"), *Bignonia unguis-cati* ("Liane Patate" or "Patte poule piquant"). *Rev. Agric. Maurice* 26, 1947 (3-10).

It is considered doubtful whether *Paederia foetida* can be economically eradicated with the available herbicides. "Liane lastique" was easily killed by one spraying with M.C.P.A. or D.C.P.A., using either 0.1% or 0.2% concentration. For *Asystasia gangetica* and *Thunbergia fragrans* Methoxone was effective. Sodium chlorate was the most efficient method of control for *Bignonia unguis-cati*.

[256] 633.61-2.51
EVANS, H. **Results of some preliminary investigations on the control of weeds in Mauritius**. Part VII. Data on some additional noxious weeds. Part VIII. Further experiments on the control of Herbe Bol, Herbe Chinois and Herbe Solférino. *Rev. Agric. Maurice* 26, 1947 (53-68).

Sodium chlorate was an effective means of controlling *Wikstroemia indica* (Herbe Tourterelle) and *Artemisia vulgaris* (Herbe Chinois), *Acacia concinna* (Sappan, Chickakai), *Mimosa pudica* (Sensitive) and *Alternanthera sessilis*.

Lantana camara, *Alocasia macrorrhiza*, *Tridax procumbens* (Herbe Caille), *Striga hirsuta* (Herbe feu), *Cuscuta reflexa*, *Commelina benghalensis* and *Commelina communis* (collectively known as Herbe Cochon) were all satisfactorily controlled with M.C.P.A.

Complete control of Herbe Bol (*Hydrocotyle bonariensis*) can be obtained during the winter months by one application of a high concentration of M.C.P.A. or D.C.P.A. In the summer months spraying has to be repeated three times with a concentration of 0.1%.

[257] 633.61-2.51
SLOAN, W. J. S. **The weed problem.** *Cane Grow. Quart. Bull.* 11, 1947 (24-30).

Weed control by crop rotation, efficient seed-bed preparation, the judicious use of implements for inter-row cultivation and to some extent hand-hoeing are all necessary for effective economic control of weed growth. With inter-row cultivation the erosion factor cannot be disregarded.

[258] 633.61-2.954 : 577.17
HOLME, R. V. **The use of selective weed-killers in the cane field.** *Proc. Meetg. B.W.I. Sug. Tech.* 1946 (91-92).

A brief account of hormone weed-killers. Weeds in cane fields that are difficult to eradicate are susceptible to 4-chloro-2 methylphenoxy-acetic acids, but at different dosages.

[259] 633.63 : 546.331.31
CROWTHER, E. M. **The use of salt for sugar beet.** *Brit. Sug. Beet Rev.* 16, 1947 (19-22). [Rothamsted]

Trials with agricultural NaCl were held over the last 7 years on commercial farms in all the factory areas of England. Use of NaCl did not increase the drain on soil K. It is important, however, to plough in the beet leaves, or feed them to stock and preserve the liquid manure for return to the land. It is recommended that all beet should be given about 3 cwt./acre of agricultural salt at any convenient time well before sowing and by any convenient method, unless the Na necessary for beet can be supplied as NaNO_3 or other fertilizer.

[260] 633.63-1.427.3
BROWN, R. J. **Petiole tests as a measure of soil fertility.** *Proc. Amer. Soc. Sug. Beet Tech.* 4, 1946 (96-101). C.A. 41 (6072). [Gt. Western Sug. Co., Denver, Colo.]

Though soil tests and petiole tests on sugar beet have shown excellent correlation, the correlation of petiole tests and yields is often doubtful. The most that can be said is that if petiole samples are taken from various plots on the same field, differences in fertility will be reflected by differences in the tests, but if the whole field is represented by a single sample the results of the tests are questionable unless they are high. Where a large number of fields are sampled and the results averaged, the petiole test is very useful as a measure of general fertility.

[261] 633.63-1.43
SMITH, F. W.; COOK, R. L. **The effect of soil aeration, moisture and compaction on nitrification and oxidation and the growth of sugar beets following corn and legumes in pot cultures.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (402-406). [Mich. Agric. Expt. Sta.]

Compaction of the soil following all crops resulted in a considerable decrease in yield of sugar beets. The effect of the compaction of the soil was more serious than that of excess water. Aeration was a limiting factor for the growth of sugar beet in a compacted soil. Inadequate aeration was more injurious to sugar beets following legumes than to beets following maize.

[262] 633.63-1.432.2 : 581.192
WIMMER, G.; SAMMET, K.; LESCH, W. **[The influence of the fluctuating moisture content of the soil on the yield and quality of different varieties of sugar beet.]** *Ztschr. Wirtschaftsgr. Zuckerindust.* 94, 1944 (2-25). C.A. 41 (7033).

The absorption of N, K_2O and P_2O_5 at different moisture contents was different for two varieties. The greater the moisture content of the soil the greater was the dry substance produced by the soluble portion of the nutrients.

[263] 633.63-1.584 : 633.3
DECOUX, L.; VANDERWAEREN, J.; SIMON, M. **La betterave en culture associée. [Sugar beet under mixed cropping.]** *Inst. Belge Amélior. Better Pub.* 12, 1944 (379). Bull. Assoc. Chim. Sucr. 63, 1946 (425). [F.]

Mixed cropping with dwarf peas, dwarf beans and violet clover produced inconclusive results due to imperfect development of the legumes, but mixed cropping did not contribute much N to the sugar beet, which seemed to profit most from the extra space resulting from removal of the other crop. Leguminous green manure turned in previously gave more N to the beet than simultaneous growth of clover.

[264] 633.63-1.811.5
SIMON, M. Le rôle du sodium chez la betterave sucrière. [The role of sodium in sugar beet.] *Inst. Belge Amélior. Better. Pub.* 15, 1947 (69-76). [F.f.e.]

Although Na is a useful plant nutrient for the production of sugar beet, it has on some soils a harmful effect on the structure, and care should be taken in its application.

[265] 633.63-1.83-1.816.2
DECOUX, L.; VANDERWAEREN, J.; SIMON, M. Application hâtive ou tardive de divers sels potassiques à la betterave. [Early or late application of various potassium salts to sugar beet.] *Inst. Belge Amélior. Better. Pub.* 11, 1943 (699-705). *Bull. Assoc. Chim. Sucr.* 63, 1946 (425). [F.]

Unusual April dryness and severe yellowing made the results inconclusive. Patentkali containing 26% K_2O gave the greatest increase in sugar yield, and soil incrustations occurred in the plots receiving KCl of 40% and 20% K_2O content.

[266] 633.63-1.874
RIETBERG, H. Groenbemestings proefvelden 1942. [Green-manure experimental fields 1942.] *Meded. Inst. Suikerbiet.* 3, 1947 (84-98). [Du.e.f.]

Vetch, summer rapeseed and barnyard manure, all in addition to 90 kg. of N per ha., were compared with two no-green-manure plots, one with the standard 90 kg. of N the other with 120 kg. of N per ha. Vetch and barnyard manure gave the best sugar yield, resulting, with vetch, from a high root yield, and with barnyard manure, from a considerable increase in sugar content. A leguminous green manure was more valuable than a non-leguminous one. The data proved the necessity of added K and P, a green manure alone not being able to produce the maximum yield.

[267] 633.63-2.19 : 546.27
PFEIL, E.; LÜDECKE, H.; SAMMET, K., ET AL. [Pot experiments with domestic raw materials and by-products containing boron for the combating of heart rot and dry rot of sugar beets.] *Bodenk. Pl. Ernähr.* 34, 1944 (59-101). C.A. 41 (6652). [G.]

The experiments were carried out over 4 years in large pots containing 33 kg. of Hohenbockaer sand with 10% moisture. During growth the moisture was increased to 14%. Seven by-products of German soda factories, brown-coal ash, humus soil and North Sea mud were tested for their ability to combat heart rot and dry rot. All were beneficial, the extent being correlated with the water-soluble B content. Unidentified fractions of the products tested had a favourable effect on the general growth of the beets and on the buffering of the soil. The antagonistic effects of B and other components are not yet clear.

[268] 633.63-2.2
JONES, F. G. W.; PETHERBRIDGE, F. R. Beet eelworm. *Brit. Sug. Beet Rev.* 16, 1947 (31-36). [Sch. Agric., Cambridge]

A list of host crops and weeds, including mangolds, spinach and most of the common Brassicas is provided. All appear capable of increasing the eelworm population, but sugar beet, remaining 8 or 9 months in the soil, is probably more dangerous than mustard, etc., grown as catch crops.

No chemical has been found to deal satisfactorily with eelworm on a field scale, but the eelworm population decreases rapidly after non-susceptible crops, such as potatoes, carrots, chicory, and also after cereals provided the land is clean of host plants, which is rare on fields used the previous year to grow Brassicas for seed. Leys, clover, sainfoin and lucerne, especially if left down for some years, are all beneficial. A 4-course rotation is best for infested land, but badly infested land may need a long rest, up to 10 years, before a 4-course rotation is begun. Spread to clean land is minimized by care in carting beet and susceptible crops, hiring implements, purchasing seed potatoes from non-infested areas and sewage sludge from farms where mangolds and Brassicas are frequently grown.

[269] 633.63-2.2
PRICE JONES, D. Calcium chloroacetate as a soil dressing against beet eelworm, *Heterodera schachtii* Schmidt with certain additional observations. *Ann. Appl. Biol.* 34, 1947 (240-245). [Sch. Agric., Cambridge]

3 and 6 cwt./acre of calcium chloroacetate produced significant increases in yields of sugar beet on fen soil of the "skirt" type infested with *Heterodera schachtii*. The material had no effect on the eelworm infestation of the soil, whether measured by cysts, visible cysts or eggs and larvae.

[270] 633.63-2.4-2.952
DOYLE, R. J. Controlling sugar beet blackroot. *Sugar* 42, No. 11, 1947 (36-37).

Treatment of the soil of greenhouse seed beds with the proprietary fungicide "Arasan" at a rate of 3 lb. per acre gave complete control of blackroot, though treatment of the seeds was ineffective. Doses of more than 10 lb. per acre were highly toxic to sugar-beet seedlings. Tests have shown that the treatment is also effective in the field when Arasan is applied with the fertilizer or in bands along the beet rows. The causative fungus, "water mould," of blackroot has been isolated by W. McKeen in Ontario.

Arasan has also proved effective, when applied to the soil, in controlling rot of tomato, melon and cucumber seedlings.

[271] 633.689
SA' AID, M., BIN SHEIK DAUD. Ubi kemili (*Coleus tuberosus*). *Malay. Agric. J.* 30, 1947 (130-132).

This crop does not appear to require manure on normally fertile soils, but good drainage is essential. The plants produce edible tubers in clusters at the base of the stem. Methods of propagation, cultivation, harvesting and use of the crop are described.

633.7 STIMULANTS

[272] 633.71-1.432.2 : 581.192
MCMURTREY, J. E., JR.; BOWLING, J. D.; BROWN, D. E., ET AL. Effects of controlled soil moisture on growth, composition, yield and quality of Maryland tobacco. *J. Agric. Res.* 75, 1947 (215-249).

Tests were conducted on light soils subject to leaching. A larger leaf with a lower weight per unit area was produced when irrigation was used as a supplement to rainfall. The K content of the leaf was markedly increased by irrigation, and this may be a partial explanation of the high quality of the product. The fire-holding capacity of the leaf was improved when there was an abundant supply of moisture from rainfall and supplemental water.

[273] 633.71-1.81 : 581.192
ASKEW, H. O.; BLICK, R. T. J.; WATSON, J. The effect of fertilizers and their manner of application on chemical composition of flue-cured tobacco. *N.Z. J. Sci. Tech.* 29A, 1947 (5-17). [Cawthron Inst.]

During 1942-1945 variation in the rate of application of 3-8-8 fertilizer had almost no effect on the chemical composition of tobacco. Increasing the proportion of N in the fertilizer slightly increased the N content of the tobacco, and increasing the proportion of K slightly increased the K content, but decreased the N content. $(\text{NH}_4)_2\text{SO}_4$, urea and dried blood increased the N content; $(\text{NH}_4)_2\text{SO}_4$ reduced the sugar content. Sulphate of potash gave higher N but lower sugar contents than the muriate. Muriate increased the Cl content, and sulphate increased the total-S content. Omission of N, P and K from the fertilizer caused low values for these constituents in the leaf. The addition of Mg as serpentine super. or as dolomite increased the Mg and N contents. Dolomite reduced the sugar content.

The method of application of the fertilizer did not affect the N or sugar content except that when placed in side bands some reduction in N and sugars occurred. Time of application as a side-dressing after planting also had little effect on leaf composition.

[274] 633.71-1.81 : 581.192
CAWTHRON INSTITUTE. Chemical composition of tobacco with different fertilizer treatment. *Cawthron Inst. Rept.* 1946-7, 1947 (30).

$(\text{NH}_4)_2\text{SO}_4$ gave a high N and low sugar content in cured leaf. Muriate of potash increased both N and sugar content, and a mixture of muriate and sulphate of potash gave the highest sugar content and an intermediate N figure. Dolomite reduced

content of sugar and increased that of N. Reduction in the sulphur and lime contents of fertilizers had little effect on the sugar content. Application of the top-dressing in two parts had little effect on sugar content. Fertilizer placement in side bands decreased the sugar and increased the N content.

[275] 633.71-1.811.3 : 581.192
BOWLING, J. D.; BROWN, D. E. **Role of potash in growth and nutrition of Maryland tobacco.** *U.S.D.A. Tech. Bull.* 933, 1947, pp. 28.

Fertilizing with K increases the weight, colour, texture, combustibility and hygroscopic qualities of tobacco leaf. At low rates, muriate produced greater acre yield and greater acre value than sulphate, but at higher rates the acre value produced with muriate was less than with sulphate. Carbonate was as good as sulphate. Sulphate increased the average height of plants and the length of internodes, but did not affect the number of leaves. Muriate produced more leaves and shorter internodes. With muriate, cured leaves were lighter, more hygroscopic and of poorer burning quality than leaves produced with sulphate. With carbonate, cured leaves weighed slightly less than leaves with sulphate. Muriate gave a less good colour of cured leaf than sulphate or carbonate.

The average percentage of K in the leaves was higher when plants were grown under humid conditions. Increase in the K content of the plant was accompanied by decrease in Ca and Mg. 3.9% of K_2O in the dry leaf is the minimum content necessary to prevent deficiency symptoms.

[276] 633.71-1.84 : 581.192
STALÉ, J.; BOVAY, E. Contribution à l'étude de l'amélioration des tabacs indigènes (2). Influence de la fumure azotée sur la qualité et sur les rendements. [Contribution to the study of the improvement of Swiss tobacco (2). Influence of nitrogen fertilization on quality and yields.] *Landw. Jahrb. Schweiz.* 71, 1947 (225-249). [F.g.]

Tobacco plants in a fairly calcareous light alluvium well provided with P and humus but poor in K were given PK dressings with mineral N in different forms. With untopped plants, mineral N reduced the quality, reducing

the Schmuck ($\frac{\text{soluble carbohydrates}}{\text{total N—nicotine N}}$) and nitrogen ($\frac{\text{nicotine N}}{\text{ammonia N}}$) coefficients, and increasing

the polyphenolic ($\frac{\text{polyphenols}}{\text{total reducing compounds}}$),

but with topped plants it corrected the prejudicial effects of topping, the optimum rate for quality being 40-60 kg. of N/ha., nitrate N being superior to other forms. In pot experiments on the effect of adding increasing quantities of mineral N, larger applications progressively decreased the quality without proportionately increasing the yield. Organic manure, given as 4 and 6 kg. of compost/m.², with basal NPK, while increasing yields considerably, seriously decreased the quality of the leaf.

[277] 633.71-2.3
STEINBERG, R. A. **Growth responses of tobacco seedlings in aseptic culture to diffusates of some common soil bacteria.** *J. Agric. Res.* 75, 1947 (199-206). [U.S.D.A. Div. Pl. Indust.]

Soil from fields of severely frenced tobacco plants was often incapable of producing frencing in the greenhouse. Abnormal plants transplanted to fresh soil almost always resumed normal growth. An investigation was made to determine whether any of the more common species of soil bacteria form diffusates capable of causing abnormal alterations in the morphology of tobacco plants. Tobacco seedlings were grown aseptically on 50 c.c. of a mineral agar solution. Inoculations of the agar at a distance from the stems of the seedlings with 60 species of presumably non-pathogenic soil bacteria led in several instances to alterations in the morphology of the seedlings. These hormonoid effects included chlorosis which simulated that due to mineral deficiency. Symptoms of abnormality were correlated with distance and number of bacterial colonies, age of seedlings and bacterial strain. An analogy is drawn between the hormonoid effects of the diffusates and those obtained in frencing of tobacco.

[278] 633.71-2.8
BORDELEAU, R. La mosaïque du tabac hiverne-t-elle dans nos sols? [Does tobacco

mosaic overwinter in our soils?]
Rept. Quebec Soc. Prot. Pl. 1943-1944, 1947 (?)
(80-83). R.A.M. 26 (423).

When healthy tobacco was planted in plots where diseased plants had been disced in, heavy infection resulted, although precautions were taken against the introduction of the disease from other sources. Rotation should be a means of control.

[279] 633.72-1.51
TUBBS, F. R. **The effect of cultivation on the growth of young tea.** *Emp. J. Expt. Agric.* 15, 1947 (160-166). [Tea Res. Inst., Ceylon.]

Three methods of cultivation—holing, trenching and forking—were compared. The principal inference from the data was a confirmation of the permanence of the effects of a single thorough disturbance on the structure of a tropical red-brown earth, these effects persisting for at least 8 years. With soils exhibiting such stability of physical condition, frequent deep cultivations serve no useful purpose. The inefficiency of commercial "envelope" forking in achieving deep cultivation was very apparent. The growth data showed the absence of any response to more effective, or deeper, disturbance of the soil. No significant difference was found in the distribution of roots in depth between the plants in the holed plots and those in the trenched plots, notwithstanding the considerable and continued difference in the state of consolidation of the surrounding soil.

[280] 633.72-1.81
FORBES, A. P. S. **Note on the residual value of cattle manure.** *Nyasaland Agric. Quart. J.* 1, 1941 (24-26).

10 tons/acre of cattle manure, 50 lb./acre of K_2SO_4 , 35 lb./acre of super. and 100 lb./acre of $(NH_4)_2SO_4$ in various combinations were applied to tea plots. 10 tons/acre of manure was superior to 200 lb./acre of balanced artificial fertilizer. The experiment was continued to see how long the plots that had received manure would continue to give significantly higher yield when the whole experiment received a balanced fertilizer yearly. The manure increased yield for only two years after application.

[281] 633.72-1.811.2-2.51
EDEN, T. **Manurial responses of tea and weeds.** *Tea Quart.* 29, 1947 (5-9).

The application of large amounts of P such as 60 lb. of P_2O_5 /acre is not only wasteful for tea production but is also injurious and encourages weed growth. When plots were left unweeded for $3\frac{1}{2}$ months the weight of weeds removed from the P plots was $2\frac{1}{2}$ times as great as that removed from control plots which had not received P for two cycles. Experiments are now being made with P applications below 30 lb. per acre in an endeavour to find the optimal range. After twelve years of the experiment, deterioration has set in among the mature tea on the no-potash plots. During the last cycle 60 lb. of tea per acre have been lost owing to K_2O deficiency. This is partly due to the amount of potash removed by weeds.

[282] 633.72-2.112
FORBES, A. P. S. **The tea crop and drought.** *Nyasaland Agric. Quart. J.* 1, 1941 (15-19).

During drought, tea leaves should be removed by pruning and left on the soil surface as a mulch. The soil should not be disturbed to hoe in the prunings. Incidence of tea-yellows disease increases during drought, especially on bushes pruned very early; the tea bush is unable to take in S owing to the absence of soil moisture.

[283] 633.73-1.445.6:581.144.2
FRANCO, C. M.; INFORZATO, R. O sistema radicular do cafeeiro nos principais tipos de solo do Estado de São Paulo. [The root system of coffee in the principal soil types of the State of São Paulo.] *Bragantia* 6, 1946 (443-457). [Pt.e.]

A modification of the Guiscafré-Arrilaga and Gomez method for the study of the root system of the coffee plant consists in digging a ditch along a row of four plants, 15 cm. away from the centre of the trunks. The depth of the ditch was determined by the depth of root penetration. Blocks of soil 30 cm. square and 30 cm. thick in the lower layers were cut to include a complete cross-section of the root system. The roots from each block were washed, air-dried and weighed. The weight of the whole root system is calculated from a formula.

The root system of coffee was studied in four types of soil. As the upper layers contained heavy non-absorbing roots and the lower layers many active light-weight

roots, a study of the root distribution based on weight alone might have led to erroneous conclusions. An excavation map was therefore drawn on a black cloth true to scale, and the roots removed from each soil block were spread in the corresponding place on the map. The best root distribution was found in the soil "terra-roxa misturada," where the roots extended beyond a depth of 2.5 m., and the poorest was found in the soil "terra-roxa legitima" where the roots were mostly confined to the superficial layers.

[284] 633.79-2-1.416
TOLHURST, J. A. H. Soil conditions in relation to nettlehead of hops in the West Midlands. Progress report 1946. Long Ashton Agric. Hort. Res. Sta. Rept. 1946 (105-112).

There was no correlation between soil type and nutritional status, or between nettlehead and nutrition as expressed by tissue tests. The work was of a preliminary nature.

633.8 AROMATIC, MEDICINAL AND OIL PLANTS

[285] 633.821-1.811
CIBES, H. R. ; CHILDERS, N. F. ; LOUSTALOT, A. J. Influence of mineral deficiencies on growth and composition of vanilla vines. *Plant Physiol.* 22, 1947 (291-299). C.A. 41 (6652). [U.S.D.A., Mayaguez, P.R.]

A deficiency of P resulted in poor growth and dying of the roots and tops. The symptoms resembled closely those frequently seen in the field on plants dying of the so-called "root-rot" disease. N and K deficiency resulted in poor growth of the tops and roots, but there was little or no death of tissues under the conditions of the experiment. Good root and top development was obtained with plants growing only in mulch that was irrigated with distilled water. This indicates that vanilla can obtain the necessary minerals from mulch alone and that the standard recommendation of heavy mulching in vanilleries is sound.

[286] 633.841-2.4-1.415.1
CHOWDHURY, S. Effect of hydrogen-ion concentration on the growth and parasitism of *Sclerotium rolfsii* Sacc. [on

pepper]. *Indian J. Agric. Sci.* 16, 1946 (293-296). [Plant Path. Lab., Sylhet, Assam]

The optimum pH for growth and sclerotial formation was 6.4, but the fungus could grow over a wide reaction range, and no difference was found in the pH of soils from healthy and affected fields.

[287] 633.841-2.4-1.84
CHOWDHURY, S. Effect of manuring on the sclerotial wilt of pan (*Piper betle* L.). *Indian J. Agric. Sci.* 16, 1946 (290-293). [Plant Path. Lab., Sylhet, Assam]

Mustard oilcake, ammonium sulphate, sodium nitrate and ammonium phosphate were effective in reducing mortality from attack of *Sclerotium rolfsii* in proportion to the amount of N applied, and independently of the form of N.

[288] 633.854-78-1.5
SELLSCHOP, J. ; DU TOIT, J. J. The production of sunflowers. *Farm. S. Africa* 22, 1947 (633-637). [Coll. Agric., Potchefstroom]

Sunflower succeeds wherever maize is generally produced. It is more drought-resistant and tolerates light frosts better than maize. It also does better than maize on poor soil, and is more tolerant of alkalinity. Super. should be applied at the rate of 200 to 400 lb. per morgen on very poor soils, and fertilizer mixtures 2 : 12 : 2 and 3 : 13 : 3 at the rate of 200 to 400 lb. per morgen. Sunflower stalks are sometimes gathered and burnt for the potash they contain. Experiments have shown that higher yields have been obtained from maize or wheat following sunflowers than following maize. Continuous growing of sunflowers on the same land should be avoided owing to the danger of eelworm infestation. Crops prone to eelworm disease should not be used to precede or follow sunflowers. Sunflowers have been shown in Rhodesia to be an excellent crop to precede groundnuts.

633.9 RUBBER PLANTS

[289] 633.913.31-1.432.2
DORTIGNAC, E. J. Guayule response to soil moisture under dry-land culture in California. *U.S.D.A. Forest Serv. Emergency Rubber Proj.* 1946, pp. 59. *Biol. Abs.* 21 (1502).

Guayule responds to the available soil water in growth, rubber concentration and production. The roots penetrate to 7-8 feet during the first season, 15-16 feet during the second season and 17-19 feet during the third season. Most of the available water was exhausted to within a few feet of the recorded maximum depth of rooting. In spring and early summer growth is most rapid, accompanied by a decrease in the rubber hydrocarbon concentration. In late summer and early autumn increase in millable shrub weight continues and rubber hydrocarbon concentration is at its highest rate. During late autumn and early winter there is little increase in weight, but a significant increase in rubber concentration is noted. The amount of growth in millable shrub during the first year was 400-1600 lb./acre. The increase during the second year was 1400-3900 lb./acre. During the third year the increase was only 800-1400 lb. This sharp decrease is associated with the exhaustion of available soil-water supply even on the wettest site, which received 19 inches of rainfall.

634 ORCHARDS. FRUIT

[290] 634-I.347-24
WILCOX, J. C. **Sprinkler irrigation of orchards in British Columbia.** *Canada Dept. Agric. Farm. Bull.* 144, 1947, pp. 53. [Expt. Sta., Summerland, B.C.]

Cover crops can usually be started more easily and grow more luxuriantly under the sprinkler method than under the furrow method of irrigation. A combination of grass sods and sprinkling can almost eliminate surface erosion from orchards. The more vigorous growth of trees with sprinkling is due partly to better soil-moisture conditions and partly to fertilizer which is already in the soil being carried down to the tree roots by irrigation water. It may be advisable to reduce the rate of fertilizer application for a year or two after the change-over from furrow irrigation, especially if the trees are very vigorous.

[291] 634-I.459-I.61
WILCOX, J. C. **Soil conservation and land use in southern British Columbia.** *Agric. Inst. Rev.* 2, 1947 (401-403, 448).

Erosion is liable to be serious on irrigated orchard land, especially where the furrow system of irrigation is used. Sod cover crops should be grown, cultivation should be reduced to a minimum, irrigation furrows should be contoured as much as possible or, better, under-tree sprinkler irrigation should be adopted. Mulching and contour cultivation should be used on non-irrigated land where the rainfall is not heavy enough for a cover crop.

As water is a main factor limiting a rapid expansion of the irrigated area, water conservation is as important as soil conservation. Among other measures referred to for saving water, it is estimated that a change from furrow to sprinkling irrigation would save 10% of the water used on a deep, heavy soil, and 50% on a shallow sand.

[292] 634-II-2.19-I.8II.6
CAWTHRON INSTITUTE. **Magnesium deficiency of apples.** *Cawthron Inst. Rept.* 1946-7, 1947 (18-19).

Satisfactory control of leaf scorch was obtained where fresh applications of Mg compounds were given; $MgCO_3$ and ground dolomite gave better results than Epsom salts. Trees that received 24 lb. of ground limestone per tree in 1939 were in much better condition than untreated trees. Neither mineral and nitrogen content nor sugar content and acidity of juice have shown definite changes after the application of Mg compounds.

[293] 634-13-1.81
GOUËRE, A. **Essais de fumure de longue durée sur Poirier-Passe-Crassane.** [Long term manurial experiments with Passe-Crassane pears.] *Ann. Agron.* 17, 1947 (233-241). [F.]

Fertilizers were applied to the surface of the soil and by injection using a fertilizer lance. The application of a complete fertilizer with a fertilizer lance increased the yield of fruit during three years by about 20% as compared with the check plots and the NP plots. This increase was due principally to increase in weight rather than to increase in quantity of pears. For the best results a complete fertilizer should be used and the fruit picked as late as possible.

[294] 634-23-1.81
THORNE, D. W.; STARK, A. L. **The management of sweet cherry orchard**

soils. *Farm and Home Sci.* 2, No. 4, 1946 (3, 14-15). Biol. Abs. 21 (1494). [Agric. Expt. Sta., Logan, Utah]

Yields obtained were in increasing order with the following fertilizer treatments: no fertilizer, super., farm manure, $(\text{NH}_4)_2\text{SO}_4$ and $(\text{NH}_4)_2\text{SO}_4$ + super. combined. Farm manure at 10 tons/acre did not supply sufficient N for maximum yields. Cover crops did not have any significant influence on yield. Recommendations on soil-management practices for sweet-cherry orchards are made on the basis of the studies conducted.

[295] 634.25 : 581.192
LIWERANT, J. Contribution à l'étude de la fertilisation du pêcher. Note 1 : teneurs en azote, acide phosphorique et potasse des différentes parties du pêcher. [A study of manuring of peach trees. Note 1 : the nitrogen, phosphoric-acid and potash contents of different parts of a peach tree.] *Ann. Agron.* 17, 1947 (226-232). [F.]

[296] 634.25-1.84
COWART, F. F.; SAVAGE, E. F. The effect of nitrogen fertilization on yield and growth of Elberta peach trees. *Ga. Expt. Sta. Bull.* 253, 1947, pp. 16.

N at 0.48 lb. per tree (6 lb. of mixed fertilizer containing 8% of N) was the optimum treatment for tree growth and production, especially when applied $\frac{1}{2}$ in March and $\frac{1}{2}$ in June. It increased the resistance of the tree (but not of flower buds, open blossoms or young fruits) to frost injury, but did not affect the size of unthinned fruit. Varying N treatments did not affect the initiation of growth and blossoming, but maturity of fruit was delayed approximately 1 day for each $\frac{1}{10}$ lb. of N applied. Fruit colour was best on trees receiving low N treatment, but satisfactory on all except those receiving 0.72 lb. of N.

[297] 634.3-1.81
CARRANTE, V. Secondo contributo alle esperienze permanenti di concimazione degli agrumi. (Quinquennio 1942-46.) [Second contribution regarding permanent experiments on the manuring of citrus trees. (Quinquennium 1942-46.)] *Ann. Sper. Agrar. Roma* 1 (n.s.), 1947 (27-69). [I.e.]

In manuring citrus (preferably annually) N is always indispensable. It is best applied

half as organic and half as inorganic. The effect of K in large quantities was primarily to produce a finer fruit texture. P was least effective but increased the vitamin-C content. An N:P:K ratio of 1:1:1 was most effective, provided not more than 100 gm. of nutrients are given per tree. If more is applied N should be increased proportionately to P and K.

[298] 634.3-2.III-1.811.9
FRISBIE, S. L. Effect of fertilization on cold damage. *Citrus Indust.* 28, No. 6, 1947 (6-7, 15). C.A. 41 (6360).

Citrus trees that had received Mg, Mn, Cu and Zn in addition to NPK fertilizers showed little damage from frost and bore marketable fruit 45 days later. Trees that had received no minor-element fertilizer were severely defoliated and are not expected to set fruit for 2 or 3 years.

[299] 634.31 : 546.621
HAAS, A. R. C. Growth stimulation in Valencia orange trees. *Calif. Citrog.* 32, 1947 (185-198). Biol. Abs. 21 (1494). [Univ. Calif., Riverside]

Considerable improvement has been obtained by the use of aluminium citrate in soil cultures with budded nursery trees and with Valencia orange leafy-twigs cuttings whip-grafted on Keen sour-orange seedlings as rootstocks. It is suggested that minor elements other than those commonly used for citrus may be found to stimulate the production of healthy growth in citrus.

[300] 634.31 : 546.711
CAMP, A. F., ET AL. Physiological studies. *Fla. Agric. Expt. Sta. Ann. Rept.* 1945 (164-165).

MnSO_4 was applied at rates of $\frac{1}{4}$ -4 lb. twice yearly to the bases of individual orange trees. After 4 years, the Mn content of leaves had risen from 25 p.p.m. to 94 p.p.m. of dry weight. Mn toxicity appeared when the Fe:Mn ratio, normally about 3, became less than unity. Complete fertilizers for Mn-deficient soils of pH not greater than 6 may safely contain 1% Mn. Mn appears to favour Ca uptake, increasing the Ca:K ratio from 2.5 to 3.3.

[301] 634.31-1.416
CAMP, A. F., ET AL. **Citrus nutrition studies.** *Fla. Agric. Expt. Sta. Ann. Rept.* 1945 (158-162).

Five samples of the apparently uniform soil of an orange grove were taken from positions 2 feet apart, and extracted with Morgan's sodium-acetate solution. The following variations between the samples in their content of available plant nutrients were found: Ca 621-759, Mg 126-784, K 5-38 and Mn 2.5-6 lb./acre-6 inches. pH values varied between 6.8 and 7.9. To obtain a representative mean sample of a soil, 15 or 20 samples would need to be mixed.

The influence of 20 inches of rain on the amount of bases extractable by ammonium acetate was investigated at intervals between February and June. The K extract gradually dropped to about $\frac{1}{2}$ of the first extracts, and Ca to about $\frac{3}{4}$: the diminution in Mg extract was irregular.

[302] 634.521 : 546.27
BLACKMON, G. H.; WINSOR, H. W. **Boron uptake in pecans.** *Proc. Amer. Soc. Hort. Sci.* 47, 1946 (149-152). B.A. AIII, 1947 (282).

Up to 16 lb. of borax per tree was applied on 7th June to pecan-nut trees growing in soil containing 0.09-0.18 p.p.m. of water-soluble B. By 26th June the applications of 1 lb. or more of borax had increased the B content of leaves; this increase continued until 16th August when the B content began to decrease. 16 lb. of borax increased the B content of foliage from 1.6-2.9 to 17-37. Leaf fall did not occur prematurely, but applications of more than 4 lb. per tree produced severe marginal burning of the foliage.

[303] 634.58-1.5
MILLER, W. L. **Notes on groundnut cultivation.** *Nyasaland Agric. Quart. J.* 1, 1941 (9-11).

Groundnuts can be grown successfully in Nyasaland from sea level to 4,000 feet in areas with rainfall of 20-40 inches during the growing season. The crop is drought resistant, but will stand heavy rainfall if the soil is well drained. Sandy loam soil is best and should be well ploughed. Planting should be done either on the flat or on ridges 30-36 inches apart and should be timed so that growth is finished during the rains and

the crop ripens in the early dry season. Cultivation should be sufficient to keep the soil loose and free from weeds in the early stages of growth; after this, hand pulling of larger weeds is sufficient as care must be taken not to cut the peduncles that bear pods.

[304] 634.58-1.5
SELLSCHOP, J. **Groundnuts.** *Farm. S. Africa* 22, 1947 (705-712). [Expt. Sta., Potchefstroom]

Well drained, friable loams in good physical condition, well supplied with decomposed organic matter and containing some lime are best for groundnuts. Heavy soils produce large yields, but there are difficulties in cultivating and lifting the crop. Newly broken, virgin soils containing undecomposed organic matter are not suitable. Crop rotation is essential, preferably with crops having extensive root systems such as maize, kaffircorn and millets or with plants which leave residues of organic matter that decompose readily such as sunflowers and sunnhemp. As the nodulated roots of groundnut plants are mostly removed from the soil in harvesting, another legume should be included in the rotation. All stubble and trash should be ploughed in as soon as the crop has been harvested, otherwise *Sclerotium rolfsii* Sacc., the groundnut foot-rot fungus, may multiply on the trash left on or near the surface.

Groundnuts respond to kraal manure, super. and lime, even on soils containing considerable amounts of Ca. Fertilizers should be applied to the previous crop, as groundnut seeds are easily injured by fertilizers. On new soils 300-500 lb./morgen of super. should be applied. On poor and exhausted soils 10-12 tons of manure + 300-500 lb. of super. are required. 2 : 12 : 2 or 3 : 13 : 3 fertilizer may be used in place of manure. 1-2 tons of agricultural lime should be added to soils deficient in lime. Dolomitic limestone is recommended for land that produces blank pods, as lack of Mg may be responsible.

[305] 634.58-1.55
HARRIS, H. C.; TISDALE, W. B.; TISSOT, A. N. **Importance of experimental technique in fertilizer, dusting, and calcium experiments with Florida runner peanuts.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (413-416). [Fla. Agric. Expt. Sta.]

The principal information derived from these experiments was how the treatments affected the number of peanuts left in the soil during the digging process. The plots with no treatment shed about 7% of the total amount of nuts produced, the plots with fertilizer alone shed about 17%. Dusting with Cryolite or D.D.T. in combination with the fertilizer decreased the percentage of shed to about 5%, i.e., fertilizers significantly increased the shedding while Cryolite and D.D.T. significantly decreased it. It is pointed out that these results emphasise the importance of considering the amount of nuts left in the soil in any fertilizer or dusting test with peanuts.

[306] 634.58-2.4
WILSON, C. **Concealed damage of peanuts in Alabama.** *Phytopath.* 37, 1947 (657-668). [Ala. Agric. Expt. Sta., Auburn]

Concealed damage of peanuts is a type of seed decay that begins inside the seed before the peanuts are dug. *Diplodia theobromae* has been isolated from damaged seeds. The soil-inhabiting fungi *Fusarium*, *Penicillium* and *Sclerotium bataticola* have been isolated, but they seem to come in as secondary invaders after the seed reaches an advanced stage of decay. The development of concealed damage is not associated with any particular soil type or fertilizer practice. The disease seems to be more common on land that is cropped continually to peanuts.

[307] 634.61-1.58
SCHRADER, R. H. S. **Combining the husbandry of livestock with the cultivation of coconuts.** *Coconut Conf. Colombo Papers* 1947 (17-28).

An investigation should be made to discover whether a combination of livestock and coconuts is more profitable than either coconuts or cattle alone. The discussion deals more with livestock than with coconuts. It is recommended that part of the manure obtained in the combined system should be used for making compost with coconut leaves, and the rest dealt with by treading-in the straw in a covered yard—which in Ceylon need be no more than an open shed. Infestation with the Rhinoceros beetle in relation to the making of farmyard manure and compost and its control by the Green Muscardine fungus are also discussed.

[308] 634.61-1.61
LIVERA, E. J. **Soil conservation with particular reference to coconut cultivation.** *Coconut Conf. Colombo Papers* 1947 (29-37).

[309] 634.61-1.81
SALGADO, M. L. M. **Some problems of coconut manuring.** *Coconut Conf. Colombo Papers* 1947 (9-16).

A general discussion on problems such as the combination of coconut growing, pasture and livestock management. The method of manuring by tethering cattle on coconut estates is being investigated by tethering a pair of animals to a palm tree for ten nights and determining the amount of N and K in the manure. Other problems discussed are whether artificials exhaust coconut palms, the manuring of senile palms, methods of application of manure, mechanization of coconut cultivation and soil and manurial problems of replanting.

[310] 634.723-1.86/7 : 581.192
BOULD, C.; CATLOW, E. **A manurial experiment on black currants.** *Progress report I. Long Ashton Agric. Hort. Res. Sta. Rept.* 1946 (31-36).

Organic manures, stable manure, sewage sludge, straw-sewage-sludge compost and straw-nitro-chalk compost, applied on an equal organic-matter basis, were compared with nitro-chalk-superphosphate and no manure. During the first season, treatments had no effect on growth or yield of fruit. During the second season significant differences were produced in the K_2O , P_2O_5 and N content of leaves. The mineral status of the leaves was satisfactory except in the plots treated with stable manure and with composts, which did not liberate sufficient N to maintain a satisfactory N level.

[311] 634.771-1.5
BARNETT, G. B. **Banana culture in Western Australia.** *J. Dept. Agric. W. Aust.* 24, 1947 (79-139).

The best banana land in Western Australia is brown micaceous loamy sand, generally calcareous in the subsoil, occurring near river banks. The average annual rainfall is 6 inches. The soil is poor to medium in N and organic matter, medium to normal in P and good to rich in K. Organic matter can

be built up as soon as the land is cleared by growing green crops and turning in sheep manure. Heavier, stiffer soil behind the river banks may, with proper treatment, be used for banana growing. The land should be graded and ploughed deeply, planted with a leguminous crop which is ploughed in at the flowering stage, followed by barley, oats or other straw crop. The land should be irrigated just before planting. Methods of irrigating the crop are described. A green manure crop may be grown for the first year, but thereafter the canopy of banana foliage is too dense and fertilizers must be used. 5-6 lb. of blood-and-bone meal should be applied each year to each plant at a radius of 2-3 feet from the plant. This is often supplemented by dressings of 2-3 ounces of $(\text{NH}_4)_2\text{SO}_4$ per plant per month. Excessive applications of N manures, while producing prolific vegetative growth, can be harmful to keeping qualities and flavour.

Cultivation during the life of the plantation is unnecessary. Manure should be turned in with a hoe, and early and speedy weed control is possible by spraying with 1 lb. of arsenic + 1 lb. of washing soda or $\frac{1}{2}$ lb. of caustic soda in 12 gallons of water to which 12 ounces of soap or phenyle should be added to act as spreader.

634-9 FORESTRY

(See also Abs. No. 108)

[312] 634-9-1.417.2
GROSSKOPF, W. **The origin and economic importance of humus in domestic and tropical forests.** *Mitt. Reichsinst. Ausl. Koloniale Forstwirtschaft.* 1944 (1-12). C.A. 41 (6359).

Forest humus is formed by the decomposition of plants, the conversion of lignin into humus, and the decomposition of organic substances in the soil by the activity of insects, fungi and bacteria. The importance of humus in the formation of the exchange complexes of tropical soils is emphasised.

[313] 634-972/4 : 634-975
DELEVOY, G. **Le Dilserbosch en 1941. [The Dilserbosch in 1941.]** *Bull. Soc. For. Belg.* 53, 1946 (385-406). Biol. Abs. 21 (1504). [Sta. Rech. Groenendael, Belgium]

Mixed conifer-broadleaf stands in the Campines region improve the soil, maintain a forest cover, are more fire-resistant than the surrounding pine forests and the yields of timber are higher than in broadleaf stands with no conifers. The effects of mixed fertilizers applied at the time of planting were still evident 40 years later.

[314] 634-972/4 : 634-989.84
BOUDRU, M. **Influence de l'introduction des feuillus sur la couverture morte et le sol, au Dilserbosch. [Influence of the introduction of broad leaves into the ground cover at Dilserbosch.]** *Bull. Soc. For. Belg.* 53, 1946 (406-409) Biol. Abs. 21 (1504). [F.]

Broadleaf litter decomposed more quickly than conifer needles and decreased the soil acidity.

[315] 634-973-949-1.445.73
INDIA AND BURMA. **Laterization of soil in teak plantations.** *For. Res. India Burma Pt. 1, [1946?]* (86-89) For. Abs. 9 (20).

The growth of teak appears to be influenced by the accumulation of sesquioxides in deteriorating soils of teak plantations and by the tendency of Si to leach out in such soils. The molecular ratio of Si/sesquioxides appears to be correlated with the quality of the teak.

[316] 634-989.84-1.461.1/3
TRUTNEV, A. G. ; SKRIPKINA, A. A. **The decomposition of forest litter in soils.** *Pedology* 1947 (183-187). C.A. 41 (6649). [R.]

The most intensive decomposition takes place during the first 12 days of incubation. Conifer litter decomposes more slowly than deciduous. Data are given on the composition of conifer litter, mixed conifer-deciduous litter, small-leaf plants and a loam podzol.

635 HORTICULTURE

(See also Abs. No. 193)

[317] 635-1.816.3
HEWITT, E. J. ; STANTON, W. R. **Placement experiments in the use of fertilizers. Progress report, 1945 and 1946.** *Long Ashton Agric. Hort. Res. Sta. Rept.* 1946 (43-49).

Further results obtained, comparing broadcast and liquid placement application of fertilizer for vegetables to test whether yields and earliness of crops can be economically improved by placement methods. The preparation and amounts of the liquid mixture are described. It was applied as a starter and as a top-dressing solution. The starter solution benefited transplanted crops. Seeded crops did not respond to starter solutions, but gave improved yields with broadcast dressings. With the top-dressing solution the results were not significant.

[318] 635.34-1.81
JEALOTT'S HILL RESEARCH STATION. **The cultivation, composition and utilization of the kales.** *Jealott's Hill Res. Sta. Bull.* 5, 1947, pp. 46.

Kales respond well to green manure. They are not so sensitive as sugar beet and man-golds to soil acidity. Applications of up to 20 cwt./acre of CaCO_3 after ploughing and before applying fertilizers is recommended. 15 tons/acre of well rotted farmyard manure had roughly the same effect as 2 cwt./acre of $(\text{NH}_4)_2\text{SO}_4$ as far as N was concerned. The residual value of the 15 tons of manure for following crops was equivalent to 0.6 cwt. of $(\text{NH}_4)_2\text{SO}_4$. The best practice is to apply both dung and fertilizers. 2-6 cwt./acre of super. and $\frac{1}{2}$ -2 cwt./acre of muriate of potash are usually sufficient in addition to dung. Usually 1-4 cwt./acre of $(\text{NH}_4)_2\text{SO}_4$ is applied as well as dung, the higher rate being given in two applications.

Farmyard manure is best applied in spring, either along the drills and ridges before the ridges are split back, or ploughed under just before seed sowing on the flat. If applied in winter it should be ploughed under as quickly as possible. 2 cwt./acre of super. may be combine-drilled with kale seed where the soil is deficient in P. With super., where soil P is not deficient, and always with complete fertilizer, contact drilling is risky.

[319] 635.64-1.462
CAWTHRON INSTITUTE. **Use of steam, formalin and chloropicrin.** *Cawthron Inst. Rept.* 1946-7, 1947 (23, 26-27).

Treatment with steam and chloropicrin improved yield of tomatoes by 3 lb. per plant on an old tomato glasshouse soil. On a new glasshouse soil yields after treatment were considerably higher, those after steam being

highest and after chloropicrin almost as high. After formalin yields were not much higher than on unsterilized soil.

On outdoor soil, chloropicrin increased the yield by 2 lb./plant, and steam and 2% formalin by 0.8 and 0.6 lb. respectively. D-D gave no increase in yield.

[320] 635.64-1.81
QUINN, N. R. **Out-door tomato culture.** *J. Dept. Agric. S. Aust.* 51, 1947 (56-64).

Tomatoes will grow on all soils from stiff clay to light sands, but they do best on new land with high humus content. N promotes vegetative growth often to the detriment of the fruit. K makes the plants resistant to disease and helps to overcome the ill-effects of too much N. 20 tons/acre of stable manure is recommended as a base dressing, or a cover crop may be ploughed in. Super. and K_2SO_4 should be applied before planting. The crop should be side-dressed 2 or 3 times with a complete fertilizer, followed by irrigation.

[321] 635.64-2.19-1.811.6
NICHOLAS, D. J. D.; STANTON, W. R. **Experiments on the control of magnesium deficiency in glasshouse tomatoes. IV. Concluding report.** *Long Ashton Agric. Hort. Res. Sta. Rept.* 1946 (66-79).

Foliage sprays were more effective than soil applications even though less material was used. A minimum of 10 cwt. per acre of MgSO_4 (30% MgO) was necessary to alleviate the deficiency, and better control was obtained using 20 cwt. per acre. The most effective control was obtained with a 2% spray used five times at intervals of two or three weeks during the growing season. It is suggested that there is a soil factor which inhibits the intake of Mg by the roots.

[322] 635.656-2.4-1.81
FORSBERG, J. L.; BINKLEY, A. M. **The effect of seed treatments, commercial fertilizers, and minor elements on root rot, stand, and yield of pod peas.** *Phytopath.* 37, 1947 (650-656). [Colo. Agric. Expt. Sta., Fort Collins]

Seed treatments with Ceresan, Arasan, Spergon, Yellow Cuproside and Du Pont 1452-F increased the emergence of pod peas. Fertilizers combined with seed treatments did not increase the stands. The type

and amount of fungus in the soil is probably the most important factor affecting seedling emergence. The addition of Cu, Fe, Mn and Zn did not affect stands or yields.

[323] 635.964-2
ST. IVES RESEARCH STATION, BINGLEY, YORKS. **Journal of the Board of Green-keeping Research.** *J. Bd. Greenk. Res.* 7, 1947 (11-80).

The following subjects are discussed: selective weedkillers for sports turf, cooperative trials with Methoxone, experiments on weed control, moss in lawns, maintenance and management of sea-washed turf, trials with DDT and Gammexane for control of leatherjackets.

[324] 635.98-1.421
COOK, R. L.; MILLAR, C. E. **Some techniques which help to make greenhouse investigations comparable with field plot experiments.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (298-304).

Very good correlation has resulted between greenhouse and field by using the following methods of procedure in the greenhouse. Large containers should be used, as in small containers differences due to treatment are likely to be minimized. Nutrient levels on an acre basis must be much higher in the greenhouse than in the field. N should be applied at intervals during the growing season. Fertilizer is best placed near the top of the soil column, close to the seed. Pouring water onto the surface with precautions against puddling is more satisfactory than its introduction into the bottom of the pot through glass tubes. To avoid injuring soil structure by packing the soil too firmly where moist, the soil is removed from the pots between crops and allowed to become air-dry. It is then screened through a 4-mesh sieve and returned to the pots, roots and crop residues are chopped and mixed with the dry screened soil.

GEOGRAPHICAL

(See also Abs. Nos. 4, 6, 9, 15, 25, 71, 73, 77, 107, 123, 125, 237, 245, 311)

[325] (416)631.47
HILL, D. A. **The land utilization survey of Northern Ireland.** *Scot. Geog. Mag.* 63, 1947 (17-19). *Herb. Abs.* 17 (287).

[326] (42)631.411.4
FOWLER, G. **Fenland soils and subsoils.** *Brit. Sug. Beet Rev.* 16, 1947 (23-26). [Ely Sug. Factory]

An outline of the causes of the variety in the soils and subsoils of the Fens, and its general effect on the quality of sugar beet. Virgin peat when first drained and extensively cultivated wastes away by as much as $4\frac{3}{4}$ inches per year for about 12 years and then decreasingly until, after 40 years, it loses about 1 inch per year in well drained and intensively cultivated land.

[327] (42)631.47
STAMP, L. D. **Agriculture and planning.** *J. Min. Agric.* 54, 1947 (337-343).

The tenfold classification of land as first drawn up by the Land Utilization Survey of Britain is accepted with suitable modifications for the investigation of planning of rural land use. By mapping areas outside the Urban Fence, Rural Land Utilization Officers can give advice on the least harmful direction, from the agricultural point of view, in which development can take place.

[328] (42)631.67
SKILLMAN, E. **Irrigation, with notes on crops to which it is applicable.** *Min. Agric. Bull.* 138, 1947 (pp. 47).

Rainfall and water supplies of Britain, types of wells, pumping systems and power supplies are discussed in general terms, and the operation of spray-irrigating plant in detail, including soil treatment for irrigated crops, and the times to irrigate various responsive crops in accordance with the weather and with their varying manurial needs.

Two typical spray plants are described, one for an area of 80 acres, supplying a total at any one time of 4 acres with 1 inch of water in 8 hours, and a medium plant for 6 acres, supplying $\frac{3}{4}$ acre at a time with 1 inch in 7 hours, its installation costing (pre-war) £40/acre including mains connexions—the most costly parts. There is a short treatment of surface, glasshouse and subsoil irrigation. In Britain irrigation is in general useful only for the higher-priced intensively-cultivated crops, including strawberries, and apples in dry seasons, on light sandy loams, or on brick earth on gravelly subsoil.

[329] (42)631.816
 BOYD, D. A.; MATHISON, I. **Fertilizer application. Findings of the survey of fertilizer practice.** *Agriculture* 54, 1947 (325-328). [Rothamsted Expt. Sta.]

This survey of England and Wales was concerned with the kinds of fertilizer applied to each crop grown and with the method of application, whether the fertilizer was broadcast, applied by mechanical distribution or sown with the seed in a combine drill. More fertilizer was used with all crops in districts with a large area of arable land before the war than in districts which had been largely under grass.

[330] (44)631.4
 JORET, G.; MALTERRE, H. Les sols du Santerre et du Vermandois. [**Santerre and Vermandois soils.**] *Ann. Agron.* 17, 1947 (165-212). [F.]

A thick layer of *limon* covers the chalk, and gives rise to soils particularly suitable for sugar beet. High yields of other crops such as cereals and potatoes are also produced. Analytical results are tabulated and the effect of climate on the crops and its relation to fertilizer application are discussed.

[331] (44)631.415.1
 FERRIÈRE, J. F. DE. pH des sols de France. II. pH des sols de la zone atlantique française. [**pH of the soils of France. II. pH of soils of the French Atlantic zone.**] *Ann. Agron.* 17, 1947 (213-225). [F.]

The soils of the French Atlantic regions can be divided into four main categories according to their pH. These categories, which may be distinguished not only by their natural vegetation but also by their suitability for different crops, are: (1) climax soils with a high acidity, pH below 5; (2) Transitional soils of medium acidity, pH 5-6; (3) weakly acid soils, pH 6-7; (4) basic soils, pH 7-8. The pedological characteristics and the utilization of the soils are discussed.

[332] (46)631.4
 ALBAREDA HERRERA, J. M.; GUTIERREZ RIOS, E. Suelos del Pireneo. [**Soils of the Pyrenees.**] *Estud. Geog.* 7, 1946 (5-28). [Sp.]

In the eastern part of the Spanish Pyrenees, the generally low temperatures, the short spring and the relative aridity due to the

precipitation being largely in the form of snow, favour mechanical rather than chemical weathering: on siliceous parent rocks, grey soils are formed, and on calcareous rocks, rendzinas. In the western Pyrenees, where chemical weathering predominates, the soils vary from grey to podzolic.

Pyrenean soils are much less mature than those of the Swiss alps, where evaporation is less, acidification greater and weathering more intense.

[333] (46)631.44
 ALBAREDA HERRERA, J. M. Sobre el estudio de los suelos españoles. [**The study of Spanish soils.**] *Estud. Geog.* 4, 1943 (255-266). [Sp.]

An outline discussion of the significance of the humus and clay fractions in soil classification.

[334] (46)631.48
 GARCIA-SAINZ, L. Las formaciones rojas loessico-fluviales del norte de España: su origen y semejanzas. [**The red river-loess formations of northern Spain: their origin and similarities.**] *Estud. Geog.* 5, 1944 (247-346). [Sp.]

A palaeontological, stratigraphic and chemical study concerning the river-loess formations occurring in N.W. Galicia, parts of N.E. Spain and in Majorca supports the argument that these red surface formations are all of quaternary origin. Numerous detailed maps are included, together with 21 photographs of the formations.

[335] (47)631.459: 631.61
 SOBOLEV, S. S. **Protecting the soils of the U.S.S.R.** *J. Soil Water Conserv.* 2, 1947 (123-132).

Whereas the continental climate and dissected relief are the primary causes of erosion in the U.S.S.R., other contributory causes are alleged to be various economic factors such as tax reforms which encouraged the ploughing up of virgin land. The principal areas which have undergone gully erosion are in the south and southeast. Wind erosion has been particularly destructive in the Asiatic part of the U.S.S.R. Control measures which have found the widest application are as follows: (1) Snow retention and regulation of the runoff of melting snow, (2) improvement of the structure and erosion

resistance of soils by means of crop rotations with perennial grasses, (3) shelter belts, (4) improved farming practices, ploughing on the contour to a depth of 8-11 inches and deeper, strip cropping and reducing the width of cultivated fields on steep slopes.

[336] (481)631.416.856
VOGT, T.; BRAADLIE, O. Geokjemisk og geobotanisk malmleting. IV. Plantevekst og jordbunn ved Rørosmalmene. [Geochemical and geobotanical ore prospecting. IV. Vegetation and soil of the Røros ores area]. *Kgl. Norske Vidensk. Selsk. Forh.* 115, 1942 (25-28). *Biol. Abs.* 21 (1314).

In the Røros area (Norway) there are areas of ore-poisoned soil with scanty vegetation or none. The decisive poison agent is probably Cu and possibly also FeSO_4 . There was up to 300 times as much Cu as in normal soil.

[337] (485)631.41
ÅSTRAND, H. Jordbrukskemisk forskning i Sverige och USA. [Agricultural-chemical research in Sweden and the U.S.A.] *Socker Handl.* 3, 1947 (153-160). [Sw.]

A very brief account of recent Swedish and American research connected with humus, the soil complex, determination of fertilizer requirements, trace elements and herbicides.

[338] (485)631.416.2
LÅG, J. Undersøkelser over innholdet av letttopløselig fosfor og reaksjonen i jorda på en del gårder i Østfold og Akarskus. [Readily available phosphate and soil reactions of a number of farms in Østfold and Akarskus.] *Repr. Meld. Norg. LandbrHøgsk.* 27, 1947, pp. 83. [N.e.]

In an attempt to relate readily available phosphate and soil reaction with soil types and different types of farm management 7000 representative soil samples from south-eastern Norway were collected and analysed. Mechanical analyses showed that clay and loam soils were the most frequently occurring soil types, and less than 1% of the total soils had high organic-matter content. Samples were equally divided between arable land and temporary leys. 50% of the soils had pH values between 5.0 and 6.0. Readily available P was determined by the Egér lactate method and the Swedish limit value

was used for distinguishing between soils with no or uncertain P requirement and soils with various degrees of P requirement. Only about a tenth of all soils were above the limiting value, whilst 40% showed high P requirement. In a general way the type of farming and fertilizer practice were correlated with the P status of the soil. pH values and available P values of different horizons of some profiles indicated a consistent difference between light and dark-coloured leached clay soils.—S.H.

[339] (485)631.459:551.5
PETERSSON, G. Vindens skadegörelse på åkerjord i södra Sverige. [Wind damage on cultivated land in south Sweden.] *Medd. LantbrHögsk. JordbrFörsöksanst.* 20, 1947, pp. 52. [Sw.e.]

In the sandy regions of south Sweden about 15,000 ha. are annually affected by wind erosion, mainly in May and June. Preventive measures include the growing of crops that give a continuous cover of vegetation throughout the year, reducing the size of fields and planting shelterbelts and hedges. Owing to their more rapid growth deciduous trees give better protection in a shorter time than conifers. Hawthorn and whitebeam are suitable for hedges, and certain poplars as windbreaks. Cooperation among land owners is very desirable.

[340] (492)631.44
EDELMAAN, C. H. De invloed van het klimaat op het ontstaan van de bodem in het algemeen en de Nederlandse bodem in het bijzonder. [The influence of the climate on soil formation in general and soil formation in Holland in particular.] *Tijdschr. Konink. Nederl. Aardrijksk. Genootschap* 64, 1947 (297-302). [Du.]

A popular review of the American soil classification system and its applicability to Dutch conditions.—S.H.

[341] (492)631.473
EDELMAAN, C. H. Enkele resultaten van de bodemkartering van Nederland. [Some results of soil survey in Holland.] *Landbouwk. Tijdschr.* 59, 1947 (319-327). [Du.]

The results of the recently started institute for soil survey in Holland can be summarized as dealing with the following aspects:

1. Demonstration of relationship between soil types and crops. 2. Soil cultivation and technical problems as revealed by soil survey. 3. Application of results on regional planning.—S.H.

[342] (492)631.616
BAKKER, G. DE. De inundaties in Nederland in 1944 en 1945 en de gevolgen daarvan. [The flooding in Holland in 1944 and 1945 and its consequences.] *Tijdschr. Konink. Nederl. Aardrijksk. Genootschap*. 64, 1947 (13-17). [Du.]

Maps and agricultural data from the areas which were deliberately flooded during the German occupation, and the changes in texture and chemical composition of the soils. Results of reclamation by use of gypsum are also given.—S.H.

[343] (498)631.416
MAXIM, I. Soluri din Banat analizate prin metoda fiziologic-vegetală. [Soils of Banat analysed by the plant-physiological method.] *An. Fac. Agron. Cluj* 11, 1946 (192-206). [Rm.f.]

[344] (498)633.18-1.5
SAFTA, I.; GIOSAN, N. E posibilă cultura orezului la Cluj? [Is rice culture possible in Cluj?] *An. Fac. Agron. Cluj* 11, 1946 (132-140). [Rm.e.]

Research is in progress on this problem, and it is hoped that a definite answer will be possible in a few years.

[345] (51)631.4
CHU, L. T.; SUNG, T. C.; LIU, H. P. [Soil and agricultural conditions of the Ningpo and Shaoshing area of Chekiang.] *Soil Quart.* 5, 1946 (123-134). [Ch.]

[346] (51)631.4
HSEUNG, Y. [Fifteen years of pedological researches—an informal report of the soils division.] *Soils Quart.* 5, 1946 (143-162). [Ch.]

[347] (51)631.4
HSI, L. T. [Soils and agriculture problems of Lapelang grassland of Kansu.] *Soils Quart.* 5, 1946 (177-182). [Ch.]

[348] (51)631.4
LU, F. H. [The general aspects of soils of central and southern part of Shensi.] *Soils Quart.* 5, 1946 (163-175). [Ch.]

[349] (51)631.4
MA, Y. T. [The general aspects of soil geography in Kansu.] *Soils Quart.* 5, 1946 (75-78). [Ch.]

[350] (51)631.4
MA, Y. T.; LIU, H. P. [Soil and agricultural conditions of the Chinhua area of Chekiang.] *Soils Quart.* 5, 1946 (113-122). [Ch.]

[351] (51)631.4
SUNG, T. C. [Soils of the West Yunnan border.] *Soils Quart.* 5, 1946 (79-90). [Ch.]

[352] (51)631.4
SUNG, T. C. [The general aspects of the soils of Fukien.] *Soils Quart.* 6, No. 1 (1-12). [Ch.]

[353] (51)631.415.3
LU, F. H. [The newly formed saline soils in the Ching-Wei irrigation-canal area, and suggestions for their amelioration.] *Soils Quart.* 6, No. 1 (13-17). [Ch.]

[354] (51)631.43
YU, T. J. [On the aggregation and erodibility of Chungking purple-brown soils.] *Soils Quart.* 5, 1946 (91-102). [Ch.]

[355] (51)631.445.4
CHENG, P. Y. [The content of organic matter and calcium carbonate of some chernozem soils in the Hsia-ho region of Kansu.] *Soils Quart.* 5, 1946 (103-106). [Ch.]

[356] (51)631.445.52
WANG, W. K. [The constitution of the soluble salts of some solonchak soils in Northwest China.] *Soils Quart.* 5, 1946 (135-142). [Ch.]

[357] (51)631.459
LI, L. T.; HO, C. H. [Soil erosion and silting problems of the Chialingkiang valley of Szechuan.] *Soils Quart.* 5, 1946 (107-112). [Ch.]

[358] (51)631.47
CHU, L. T. [Suggestions on the utilization and amelioration of the soils in Ninghsia.] *Soils Quart.* 5, 1946 (63-74). [Ch.]

[359] (51)633.51-1.4
 LU, F. H. [Notes on the cotton soils of Shensi.] *Soils Quart.* 5, 1946 (187-192). [Ch.]

[360] (52)631.4
 SWANSON, C. L. W. **Reconnaissance soil survey work in Japan.** *Science* 106, 1947 (256-258). [Agric. Expt. Sta., New Haven, Conn.]

The reconnaissance soil survey of Japan now being made by American scientists is the first to be made of that country using modern survey methods for classifying and mapping soils in terms of their morphological features. The most important agricultural areas are being mapped first, and a map on a 1:250,000 scale showing associations of soils is to be published for each area surveyed.

Certain representatives of the major zonal and intrazonal soil groups of the world are being identified. Profile characteristics are similar to those in the United States in the same latitudes, but local topography and parent material, especially volcanic ash, exert more influence on the kinds of soil developed than does climate. The high rainfall helps to hinder the development of soil profiles by eroding weathered materials from the steep slopes. The constant changing of the topography, the continued removal of weathered materials to lower levels, the additions of volcanic ash and the high rainfall continue to prevent development of mature profile characteristics.

On the alluvial soils of the lowlands irrigated rice is grown in summer and, in southern Japan, these soils are also cropped to wheat or barley in winter. Upland "brown forest soils" and "black forest soils" (which have not all the profile characteristics normally associated with these groups), derived chiefly from volcanic ash, are low in available P, but are suitable for small grains, potatoes, vegetables, mulberries, upland rice, tea and tobacco. In many of the red and yellow podzolic areas, because the demand for cropland is so great, many steep slopes are terraced and cropped to wheat, barley, upland rice, potatoes, vegetables and citrus fruits. Most of the grey-brown podzolic soils of the hills and mountains are forested, but, where the soil is deep enough, potatoes, fruits, vegetables and small grains are grown, and erosion is severe.

Most of the soils require heavy fertilization and liming. Compost, night soil, green manure and wood and straw ashes are used extensively. In the years 1935-1937, Japan ranked third in the world for consumption of N fertilizer and sixth for P and K fertilizers, yet it ranked nineteenth in the world distribution of arable land.

[361] (54)631.459 : 631.61
 BASU, S. K. **Anti-erosion work in Kalimpong Forest Division.** *Indian Forester* 73, 1947 (10-14). For. Abs. 9 (21).

Control measures included fencing, construction of check dams and contour drains and the creation of a ground cover of grasses and other plants.

[362] (54)631.459 : 631.61
 HAMILTON, A. P. F. **Chambal ravines reclamation scheme.** *Indian Forester* 73, 1947 (99-101). For. Abs. 9 (22).

Afforestation has been a success with regard to erosion control in this area and fully justifies further reclamation of the ravine area.

[363] (548.7)634.61-1.5
 PEIRIS, A. J. C. **Coconut in Ceylon: its productivity and possibilities.** *Coconut Conf. Colombo Papers* 1947 (45-50).

Ceylon has fallen far short of the potential productivity for coconuts, and scientific methods should be applied to coconut cultivation in order to stop the prevalent downward trend of yields.

[364] (564.3)631.47
 LITTLEJOHN, L. **Soil fertility in the arable areas of Cyprus in relation to land use.** *Proceedings of a Conference on Land Use in a Mediterranean Environment*, April, 1946, Nicosia, 1947 (35-38).

The present system of farming in the main arable area is based on a 2-course rotation of cereal and bare fallow. About a quarter of the fallow is planted each year with a leguminous crop. Considerable numbers of milking sheep and goats are kept in flocks of 50-60 on grazing grounds which are either areas which are too salt or too marshy in winter for ploughing, or flat land with a hard limestone crust near the surface, or steep land which has usually been abandoned after ploughing, because of soil erosion. Many

of these areas show signs of serious over-grazing. Any attempt at better land use should include the development of better cover in grazing areas. There can be no increase in production from arable land unless N and P be added as artificial or animal manure. Ploughing in of a green manure crop is impossible with the nail plough and iron "digger" plough in common use, and it is suggested that in a fallow year a leguminous crop should be grazed before flowering. The N in the root nodules would remain in the soil and little P would be lost.

[365] (564.3)631.47
McDONALD, J. **Land use in relation to climate and topography in Cyprus.** *Proceedings of a Conference on Land Use in a Mediterranean Environment*, April, 1946, Nicosia, 1947 (6-9).

In Cyprus, mountain ridges and steep slopes should be left under forest unless they can be adequately terraced. Below the forest are steep slopes which have unwisely been cleared for agriculture. Deciduous fruit can be grown and vineyards flourish on these slopes on terraces held by stone walls or brushwood. Most of the plains are un-irrigated, and cereals, broad beans, vicos (*Vicia sativa*) and flax for linseed are the chief winter crops. Vicos are cut green for fodder. There is mostly a fallow every other year. Spring crops of vetches are grown on flood-irrigated land in the fallow year. Cowpeas, maize for fodder, cotton and yellow-leaf tobacco are grown in early summer, on water stored in the soil from winter rainfall or flood water. Lucerne, maize, haricot beans, sesame and vegetables are grown under irrigation in the arid summer. Two potato crops are grown annually on the plains. Olive and almond trees which are drought-resistant grow on the plains, but otherwise the central plains are largely devoid of trees as a result of grazing of flocks. Citrus trees are grown with irrigation in the less extreme climate of the coastal areas.

There has been considerable soil exhaustion due to failure to replenish nutrients extracted in the cultivation of cereals. No manure or fertilizer has been applied to fields away from villages. More fodder crops should be produced and animals should be increased in number, and folded on specially grown pastures.

[366] (595)631.584
HARTLEY, C. W. S. **Experiments on the growing of off-season crops on padi land in Province Wellesley.** *Malay Agric. J.* 30, 1947 (114-122).

Satisfactory crops of groundnuts can be obtained in the off-season by application of lime, and of other crops such as sweet potato, ladies' finger, brinjal and cowpeas by the use of cattle or buffalo manure. Prawn dust is also often applied to the sweet potato crop before planting. Increased yields of padi are obtained on this soil following cultivation in the off season and it is the cultivation and not the manuring which produces the subsequent padi yield, although it is possible that liming for groundnuts may also lead to an increase. Adequate control of drainage in padi areas is of importance during the off season, since without it the entire off-season crops may be lost.

[367] (65)631.44
GAUCHER, G. **Les sols salés et les sols récents ou actuels du Bas-Chelif et des Basses-Plaines Oranaïses. [Saline soils and the recent or present soils of the Bas-Chelif and the Basses-Plaines of Oran.]** *C.R.* 225, 1947 (250-252). [F.]

A study of the black, sandy, and saline-marl soils of these regions indicates that they could not have been formed by present pedogenic conditions; their pedological study requires a knowledge of the climates of the Quaternary period.

[368] (664)633.18-1.453
DENT, J. M. **Some soil problems of empoldered rice lands in Sierra Leone.** *Emp. J. Expt. Agric.* 25, 1947 (206-212).

Three factors—excess of organic matter in the form of an excessively thick superficial layer of peat, a high concentration of salt and a toxic concentration of FeSO_4 coupled with high acidity—are responsible either singly or in combination for total or partial failures to grow rice. The first two are relatively unimportant. The presence of iron compounds is associated with mangrove vegetation, and these compounds are believed to be produced by atmospheric oxidation of FeS . Toxicity due to Fe compounds, as produced in areas of *Avicennia* mangrove, seem to be less lasting than toxicity in *Rhizophora* mangrove areas. The physiology

of both species requires full investigation before the problem of the Fe-mangrove reaction can be settled. It is suggested that *Avicennia*, which is tolerant to high concentrations of common salt, can also withstand high concentration of other ions, and possesses sap constituents that precipitate soluble salts of metals, rendering them harmless.

[369] (665.2)633.34-1.5
PORTÈRES, R. Observations sur les possibilités de culture du soja en Guinée forestière. [Observations on the possibilities of cultivating the soybean in French Guinea.] *Bull. Agron. Min. France d'Oltre Mer* 1, 1946, pp. 82. Hort. Abs. 17 (215).

The forest and subforest regions of French Guinea were found to lend themselves well to the cultivation of soybeans by Africans.

[370] (667)631.459:631.61
LYNN, C. W. Land and planning in the Northern Territories of the Gold Coast. *Farm and Forest* 7, 1946 (81-83).

In the sandstone country extending from North Ashanti to the Mamprusi scarp an area covering $\frac{2}{3}$ of the Northern Territories of the Gold Coast and containing $\frac{1}{3}$ of the population, erosion problems are confined to the overworked land around larger towns and on roadsides. Land is still adequate to support shifting cultivation where villages are small. With increase in population, mixed farming, strip cropping, control of bush fires, forest protection of watersheds and control of vegetation in drainage channels should be effective measures.

The northern and western frontier districts are granite and here soil fertility is deteriorating and sheet erosion has exposed large areas of impervious subsoil from which run-off is excessive. Land planning with mixed farming is essential.

[371] (675)631.459:631.61
TONDEUR, G. La conservation du sol au Congo Belge. [Soil conservation in the Belgian Congo.] *Bull. Agric. Congo Belge* 38, 1947 (211-315). [F.fl.]

The social and economic problems involved in a change-over from agricultural exploitation of the soil to conservation agriculture are discussed.

[372] (675)631.47
DRACHOUSOFF, V. Essai sur l'agriculture indigène au Bas-Congo. [Native agriculture in the Lower Congo district.] *Bull. Agric. Congo Belge* 38, 1947 (471-582). [F.]

Includes sections containing records gained by a rapid method of survey which is described in some detail, of the horizon depths, colour, slope, porosity, structure, texture and pH of the soils of typical villages, together with a discussion of their nature and formation. The possibilities of improvement in the use of land either within or outside the system of Bantu practices are discussed for each village in the light of local conditions.

[373] (68.01)631
SAUNDERS, A. R.; LAUBSCHER, F. X. Field experiments at Potchefstroom. *S. Africa Dept. Agric. Sci. Bull.* 246, 1945, pp. 57.

Maize espacement. With rows 3 feet apart there appears to be no advantage in grain yield from a spacing of less than 24 inches in the row, in view of harvesting costs. The lower yields from the 30- and 36-inch spacings may be offset by the greater stability of production. If the main object is the production of stover for ensilage or fodder, a relatively close spacing might be advantageous. Experiments with varying distance between the rows and within the rows indicate that to increase the former and crowd the plants in the rows reduces yields. The interplanting of rows of legumes also decreases yields especially in dry seasons, and encourages eelworms, insects and fungi.

Soil preparation. Experiments to determine the effect of replacing ploughing by surface cultivation suggest that cultivation has not had a notable effect. Ploughed plots of maize gave slightly higher yields than surface-cultivated plots receiving the same manurial treatment. With millet and cowpeas the differences were not significant.

Fertilizer trials. The dominant effect on maize was that of P, N, K and Ca had no measurable effect except that K appeared to depress yields in the absence of Ca. With super. the standard dressing of 400 lb./morgen gave the highest returns, and the largest increase in yield from a single increment of fertilizer was that from 0 lb. to 100 lb./

morgen. In recent years the yield from rock phosphate has been superior to that from super. and equals that from kraal manure.

The response with kraal manure, and with a compost of maize stalks and other plant refuse, has been significantly greater than with equivalent super., whereas with ashed kraal manure it has been significantly less. The most economic use of organic manures is on irrigated lands under continuous cropping; the use of small quantities in dry-land farming is of little benefit and possibly wasteful.

The addition of super. *after* a bare summer (wet season) fallow counteracts a depressive effect believed to be due to the reversion of super. to insoluble forms and perhaps also to phosphate deficiency due to a N-P antagonism resulting from an accumulation of nitrates during the fallow.

Crop rotation. Yields of maize in a rotation of maize, maize, millet, cowpeas with half of each plot unfertilized and super. applied to the other half have been significantly higher than those of continuous maize, and the increase is much greater in the unfertilized than in the fertilized series. The hay crops in the rotation benefited even more than the cereals from application of P, hence the common advice to fertilize the cereal crops only is open to question. Rotation by itself, however, is clearly less effective than the addition of phosphates in increasing yields.

Green manuring. A concentrated system is under test in which maize, the test crop, alternates with green-manure crops. The conclusion is inescapable that under the dry-land conditions of W. Transvaal green manuring is highly uneconomical.

[374] (71)631.47
HOPKINS, E. S. A soil conservation program for Canada. *Agric. Inst. Rev.* 2, 1947 (335-343). [Expt. Farms Serv., Ottawa]

[375] (712.3)633.11-1.5
HAY, W. D.; WHITESIDE, A. G. O.; SANFORD, B. G., ET AL. Winter wheat varieties and their production in Alberta. *Canada Dept. Agric. Farm. Bull.* 146, 1947, pp. 12.

A good cover of winter wheat affords protection against soil erosion and drifting. The crop should be sown in middle August.

[376] (72)631.416
COLWELL, W. E. Studies on the effect of nitrogen, phosphorus, and potash on the yield of corn and wheat in Mexico. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (332-340). [N.C. St. Coll., Raleigh, N.C.]

Deficiencies of both N and P were important factors in accounting for low yields of maize and wheat in Mexico. Additions of K were without effect. Recommendations are made for the application of 40-50 lb. of N and approximately 35 lb. of P_2O_5 per acre. A comparison of deep and surface placement of N did not show that one method was consistently superior to the other. Split applications were satisfactory.

[377] (728.4)631.459
VOGT, W. The population of El Salvador and its natural resources. *Pan. Amer. Un. Washington D.C. Sept.* 1946, pp. 30. [Mimeo.]

The population has more than doubled since 1900, and the country is regarded as overpopulated in relation to its natural resources. Erosion is widespread and severe.

[378] (728.6)631.459
VOGT, W. The population of Costa Rica and its natural resources. *Pan. Amer. Un. Washington D.C. July* 1946, pp. 25. [Mimeo.]

Erosion of the soil and proposed measures for initiating a conservation programme.

[379] (729.2)633.61-1.5
WIGHTMAN, G. M. Experience of the Louisiana system of cane cultivation in Jamaica. *Proc. Meetg. B.W.I. Sug. Tech.* 1946 (89-90).

A discussion.

[380] (729.8)633.61-1.557
FOSTER, C. B. The yield of sugar cane in Barbados in 1942. The yield of sugar cane in Barbados in 1946. *Barbados Dept. Sci. Agric. Bull.* 8, 1946, pp. 16; *Bull.* 9, pp. 14.

Data are tabulated on the yield per arable acre on the red soils or high rainfall areas and on the black soils or lower and intermediate rainfall areas.

[381] (73)631.459 : 631.61
BENNETT, H. H. Development of our national program of soil conservation. *Soil Sci.* 64, 1947 (259-273).

A review of the development of soil conservation in the United States, the discovery of sheet erosion, beginning of erosion research, origin of the co-ordinated method of soil conservation (1933) and development of the soil conservation district idea.

[382] (74)631.459 : 631.61
PATRICK, A. L. **Soil conservation and good land use in the Northeastern Region.** *Soil Sci.* 64, 1947 (275-287).

[383] (75)631.459 : 631.61
BUIE, T. S. **Soil conservation and good land use in the Southwestern Region.** *Soil Sci.* 64, 1947 (289-301).

Special problems in this region are the preservation and use of organic soils—peats and mucks—involving determination of the height at which the water table must be maintained to ensure minimum oxidation and subsidence of the soil. Another problem is the use and management of the more sandy soils, particularly for citrus fruit, involving prevention of soil-washing on the slopes. The inclusion of *Crotalaria* in the rotations has made possible the agricultural use of much of this land which was formerly considered unsuitable for crop production.

[384] (75)633.2.03
BLASER, R. E. ; STOKES, W. E. ; WARNER, J. D., ET AL. **Pastures for Florida.** *Fla. Agric. Expt. Sta. Bull.* 409, 1945, pp. 73.

Water control, destruction of objectionable vegetation, surface drainage, fertilization, seed bed preparation, planting technique, the establishment of temporary pastures and the general characteristics and soil requirements of suitable grass and legume species are discussed. Legumes should be grown with the grasses to supply N, and annual fertilization is necessary.

[385] (76)631.459 : 631.61
MERRILL, L. P. **Soil conservation and good land use in the Western Gulf Region.** *Soil Sci.* 64, 1947 (315-327).

(386) (77)631.459 : 551.3.051
BROWN, C. B. ; STALL, J. B. ; DE TURK, E. E. **The causes and effects of sedimentation in Lake Decatur.** *Ill. St. Water Survey Bull.* 37, 1947, pp. 62.

About $\frac{3}{4}$ of the land in the drainage area of Lake Decatur has slopes of less than 2% and the rest ranges from 2 to 15%. The area is a broad glacial-drift plain in the heart of the Corn Belt and its black prairie soils are intensively used for maize, soybeans, small grain, hay and ploughable pasture. Soil-conservation practices have been planned on only 4.2% of the land and only a half of these have been installed. It is estimated that 90% of the lake sediment comes from sheet erosion, and from 1936 to 1946 $3\frac{1}{2}$ million tons of soil were deposited in the lake. Remedial measures include raising the present dam, reduction of acreage of land in intertilled crops, crop rotations and soil-conservation practices.

[387] (77)631.47
MUSSEY, R. H. **Soil conservation and good land use in the Upper Mississippi Region.** *Soil Sci.* 64, 1947 (303-314).

[388] (77)633.13
POEHLMAN, J. M. **Growing good crops of oats in Missouri.** *Missouri Agric. Expt. Sta. Bull.* 501, 1947, pp. 18.

A general treatment, stressing the importance of early sowing in view of the sharp check to growth due to early hot dry weather.

[389] (78/9)631.459 : 631.61
LUKKER, C. **Soil conservation and good land use in the Southwestern Region.** *Soil Sci.* 64, 1947 (341-352).

[390] (78)631.459 : 631.61
MCCLYMONDS, A. E. **Soil conservation and good land use in the Northern Great Plains Region.** *Soil Sci.* 64, 1947 (329-340).

[391] (79)631.416.327
JORDAN, J. V. ; POWERS, W. L. **Status of boron in Oregon soils and plant nutrition.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (324-331). [Oreg. Agric. Expt. Sta.]

A summary of existing information as to B needs of Oregon soils and regulation of the supply as an aid to soil fertility and plant nutrition, with a preliminary B availability map of the state.

[392] (79)631.47
CHRIST, J. H. **Soil conservation and good land use in the Pacific Region.** *Soil Sci.* 64, 1947 (353-364).

There is not much wind erosion, but water erosion occurs on nearly all cultivated land, and particularly on irrigated land, in this area.

[393] (87)631.67
VENEZUELA. MINISTERIO DE OBRAS
PUBLICAS, DIRECCIÓN DE OBRAS DE RIEGO Y
CARTOGRAFIA NACIONAL. El riego en
Venezuela. [Irrigation in Venezuela.]
Cuad. Verd. No. 9, 1945, pp. 101. Herb.
Abs. 17 (299).

[394] (881)633.61-1.4
HARDY, F.; RODRIGUES, G. Some sugar-
cane soil profiles of British Guiana.
Proc. Meetg. B.W.I. Sug. Tech. 1946 (21-33).

Discussion of laboratory data on the
reaction, organic status, salinity, P and K
status of 10 profiles representing three
sugar-cane soil types. The soils have very
high acidity, high to medium total N,
medium to low C/N ratios, harmless amounts
of salt, very low available-P contents,
variable and mostly inadequate available-K₂O
contents, variable degrees of waterlogging.
Recommendations are made as to further
research; the need of pegassy soils should
be specially studied.

[395] (881)633.61-1.5
WILLIAMS, C. H. B.; CAMERON, C. Trials
of modified cultivation systems for
British Guiana. Proc. Meetg. B.W.I. Sug.
Tech. 1946 (80-88).

The need is shown for reducing the standard
bed width and/or supplementing the existing
system of open drainage ditches by subsoil
drains emptying into the existing open
ditches.

[396] (931)631.816.23
MILLER, J. M. Topdressing. N.Z. J. Agric.
75, 1947 (19-31).

An account of the history of topdressing
in New Zealand. The practice began in the
Waikato region and developed into the
system of "intensive grassland farming"
based on the practice of topdressing grassland
with P fertilizers.

[397] (931)632.954:577.15.04
LYNCH, P. B. Results of trials with
hormone weedkillers. N.Z. J. Agric. 75,
1947 (117-127).

Trials in New Zealand are still in their
initial stages, and the information at present
available is insufficient on which to base firm
recommendations for their use.

[398] (943)633.61-1.47
STIEGLITZ, C. R. VON. Soil fertility surveys
with particular reference to the Garra-
dunga area in North Queensland. Cane
Grow. Quart. Bull. 11, 1947 (43-48).

If adequate care is taken in sampling the
soil, and this sampling is confined to a
definite stage in the crop cycle, it is possible
to predict fairly accurately from the soil
analysis the likely response of the crop to
fertilizer in the field.

[399] (944)634-1.67-1.81
IRRIGATION RESEARCH STATION, GRIFFITH.
Contributions to M.I.A. farming. Aust.
Counc. Sci. Indust. Res. Irrig. Res. Stn.,
Griffith, N.S.W., 1947 (5-6).

In the Murrumbidgee Irrigation Area,
(NH₄)₂SO₄ is essential for fruit trees and
vines. Field trials have not shown that
other fertilizers are necessary, and excessive
dressings of super. are followed by Zn
deficiency in citrus. By improving soil
structure, green manures can lessen the
danger of waterlogging in wet years.

[400] (945)633.1-1.81
STATE RESEARCH FARM, WERRIBEE. Experi-
mental work and results. J. Dept. Agric.
Victoria 45, 1947 (337-353, 377-387, 392).

This farm was established in 1912. In the
volcanic areas, besides the testing of improved
cereal and flax varieties, tillage, manurial,
seeding and disease problems are investigated.
In the alluvial area the main concern is with
irrigated pastures. Manurial trials have
shown that on a clean fallow super. is the
only fertilizer required with wheat. No
beneficial results followed the use of minor
elements at Werribee. On stubble land
marked responses with cereals were obtained
from the use of (NH₄)₂SO₄ in addition to
super.

[401] (961)631.4
BLACKIE, W. J. Soils of Fiji. Fiji Agric. J.
18, 1947 (2).

A summary of the information provided
as a basis for the classification of local soils.
Geology and vegetation are described. Zonal
and intrazonal soils are listed.

[402] (961)631.4
OJALA, E. M. **Grassland plains soil of Guadalcanal, British Solomon Islands.** *N.Z. J. Sci. Tech.* 29A, 1947 (18-21).

During 1944 and 1945 American forces produced sweet corn, cucumbers and tomatoes on the heavy soils of inland grass plains. This area is being developed into a 2,800-acre government project for machine cultivation of rice. Nearly $\frac{3}{4}$ of the annual rainfall of 80 inches falls between December and April when temperatures are highest. The long, dry, cool spell has favoured the development of grass, 5-6 feet high, rather than rain forest. The only bush occurring is beside streams or in depressions. The soils are alluvial, black, fertile clay loam of stable structure, derived from calcareous raised coral benches. The subsoil is lighter in texture than the top soil. Lime content is high and the proportion of Mg to Ca is large. Humus is present in fair quantity to a depth of 12 inches. The soil drains well and dries out rapidly after rain. Bare fallow should be avoided as it results in destruction of humus by oxidation in this tropical climate.

Application of 350 lb./acre of fertilizer containing 12% of N, 18% of P_2O_5 and 12% of K_2O had no effect on growth or yield, but a heavy dressing of compost after the first year's cultivation increased yield by 50%. On low-lying areas where fine particles have accumulated as a result of sheet erosion, disc ploughs will not operate and a mouldboard plough will not penetrate deeper than

4 inches. In dry weather this soil is suitable for seed beds after the use of heavy disc harrows and produces good rice crops.

[403] (961)631.47
BLACKIE, W. J. ; FRENCH-MULLEN, M. D. **Soil investigations, Fiji—Part 6. Observations on certain soil types at Toga, Rewa.** *Fiji Agric. J.* 18, 1947 (20-24).

A soil survey and study of the agricultural history of the area provided evidence that it was unsuitable for further development. Rice cultivation would only be possible provided that heavy irrigation and intensive drainage were feasible, and these are economically impracticable because the main soil types are sands.

[404] (969)635 : 581.192
MILLER, C. D. ; ROSS, W. ; LOUIS, L. **Hawaiian-grown vegetables.** *Hawaii Agric. Expt. St. Tech. Bull.* 5, 1947, pp. 45.

40 Hawaiian-grown vegetables in many cases showed a lower Fe content, which in some cases might be due to Mn interference with Fe absorption, than vegetables grown elsewhere, and a slightly lower Ca content, possibly due to the high rate of N fertilization and the relatively low Ca status of the soil. Data at present is insufficient to permit conclusions on the relationship between the mineral contents and the soils and fertilizers used. The preparation and analysis of the vegetable material is shortly described.

INDEX TO AUTHORS

- Acharya, C. N., 169
 Adolfsson, T., 127
 Agarwal, R. R., 15
 Aladjem, R., 19
 Albareda Herrera, J. M., 110, 332, 333
 Alderfer, R. B., 221
 Alexander, L. T., 44, 220
 Alves, J. de A., 112
 Andrews, F. W., 185
 Andrews, W. B., 162
 Appleman, M. D., 120
 Applemans, Fr., 20
 Arnold, C. Y., 48
 Arnon, D. I., 135
 Askew, H. O., 273
 Astrand, H., 337
 Baeyens, J., 20, 125
 Baker, W. L., 189
 Bakker, G. de, 342
 Barber, S., 143
 Barbier, G., 33
 Barnett, G. B., 311
 Barr, H. T., 206
 Bartholomew, W. V., 51, 168
 Bartz, Q. R., 102
 Bastisse, E. M., 7
 Basu, S. K., 361
 Batra, K. C., 63
 Beale, O. W., 115
 Bear, F. E., 26
 Beasley, R. P., 84
 Beater, B. E., 111
 Beeson, K. C., 139
 Beggs, J. P., 235
 Bennett, E., 89
 Bennett, H. H., 381
 Bentley, C. F., 77
 Bertrand, D., 147
 Bertrand, G., 147
 Bétrémieux, R., 10
 Binkley, A. M., 322
 Black, C. A., 41, 159, 248
 Blackburn, F. H. B., 252
 Blackie, W. J., 401, 403
 Blackmon, G. H., 302
 Blaser, R. E., 384
 Blick, R. T. J., 273
 Blodgett, E. C., 240
 Bonnet, J. A., 155
 Bordeleau, R., 278
 Boudru, M., 314
 Bould, C., 310
 Bourgeois, L. C., 199
 Bovay, E., 276
 Bowling, J. D., 272, 275
 Boyd, D. A., 329
 Braadlie, O., 336
 Bray, R. H., 120
 Brown, C. B., 386
 Brown, D. E., 272, 275
 Brown, R. J., 260
 Brüne, F., 75
 Buchholtz, W. F., 181
 Buie, T. S., 383
 Bulger, J. W., 195
 Burd, J. S., 142
 Burkholder, P. R., 103
 Caillère, S., 10
 Cameron, C., 395
 Camp, A. F., 300, 301
 Carlson, R. F., 184
 Carrante, V., 297
 Carrigan, R. A., 226
 Catlow, E., 310
 Chaklader, M. N., 72, 218
 Chapman, H. D., 99
 Chen, C. T., 58
 Cheng, K. L., 32
 Cheng, P. Y., 355
 Childers, N. F., 285
 Childs, W. H., 39
 Chowdhury, S., 286, 287
 Christ, J. H., 392
 Chu, L. T., 345, 358
 Chudnovsky, A. F., 55
 Cibes, H. R., 285
 Clark, W. M., 84
 Clarke, G. B., 70
 Claver Aliod, M., 6
 Clements, L. B., 165
 Clyde, G. D., 128
 Collier, D., 43
 Colwell, W. E., 376
 Cook, R. L., 261, 324
 Cooper, H. P., 138
 Cooper, P. S., 152
 Costa, J. V. B. da, 112
 Cowart, F. F., 296
 Craig, N., 254
 Cralley, E. M., 219
 Crane, H. L., 137
 Crane, J. C., 250
 Crowther, E. M., 132, 259
 Cultrera, R., 92
 Cummings, G. A., 1
 Das, S., 3, 9, 24
 Davis, J. F., 11
 Davies, W. M., 239
 Dean, L. A., 16
 Decoux, L., 263, 265
 Delevoy, G., 313
 Dent, J. M., 368
 Dhingra, L. R., 64
 Dolgov, S. I., 65
 Doran, W. L., 180
 Dortignac, E. J., 289
 Doyle, R. J., 270
 Drachoussoff, V., 372
 Drosdoff, M., 145
 Drouineau, G., 47
 Duché, J., 87
 Ducker, H. C., 245
 Duley, F. L., 118
 Dunez, A., 95
 Dunlop, G., 227
 du Toit, J. J., 288
 du Toit, R., 85
 De Turk, E. E., 386
 Edelman, C. H., 340, 341
 Eden, T., 281
 Edwards, F. E., 162
 Eggers, V., 247
 Ehrlich, J., 102
 Ellison, O. T., 82
 Ellison, W. D., 82
 Emerson, R. L., 16
 Evans, A. C., 186, 188
 Evans, H., 198, 254, 255, 256
 Ewan, M. A., 157
 Fazal-Ud-Din, 61
 Fedorov, B. V., 130
 Fedorov, M. V., 94
 Fehér, D., 116
 Felber, I. M., 153
 Fenton, G. R., 106
 Ferrière, J. F. de, 331
 French-Mullen, M. D., 403
 Fogg, G. E., 104
 Forbes, A. P. S., 280, 282
 Ford, O. W., 157
 Forsberg, J. L., 322
 Forsyth, W. G. C., 35
 Foster, C. B., 380
 Fowler, G., 326
 Fraser, G. K., 35
 Fox, E. J., 164
 Franco, C. M., 283
 Frei, E., 40, 60
 Frisbie, S. L., 298
 Füleky, G., 232
 Fuller, W. H., 50, 51
 Fults, J. L., 200
 Gaines, J. C., 242
 Garcia-Sainz, L., 334
 Garman, W. H., 243
 Garrett, S. D., 244
 Garrick, P., 177
 Gaucher, G., 367
 Génèreux, H., 241
 Germanova, V. N., 59
 Ghesquière, A., 125
 Gilles, E. C., 172
 Giosan, N., 344
 Giraud, E., 100
 Gorbunov, N. I., 37
 Gouère, A., 293
 Gouny, P., 47
 Grosskopf, W., 312
 Guild, W. J. M., 188
 Gurr, C. G., 57
 Gutierrez Rios, E., 332
 Haas, A. R. C., 299
 Hallgren, G., 117
 Halverson, J. O., 224
 Hamilton, A. P. F., 362
 Hammons, J. G., 162
 Hamner, C. L., 201
 Hanley, F., 149
 Hardy, F., 78, 394
 Harkness, D., 31
 Harris, H. C., 212, 305

Hartley, C. W. S., 366
 Haviland, E. E., 190
 Hay, W. D., 375
 Hayward, H. E., 17
 Hendricks, S. B., 164
 Hénin, S., 10
 Hessler, L. E., 249
 Hewitt, E. J., 13, 317
 Hill, D. A., 325
 Hill, W. L., 164, 167
 Hisserich, M. H., 171
 Hitchcock, A. E., 202
 Ho, C. H., 357
 Hodges, E. M., 226
 Holben, F. J., 56
 Holme, R. V., 258
 Homeyer, P. G., 41
 Hopkins, E. S., 374
 Hopkins, H. T., 187
 Hopp, H., 187
 Hovland, G., 27
 Hseung, Y., 346
 Hsi, L. T., 347
 Hua, N., 58
 Huang, H. S., 208
 Hubbell, D. S., 68
 Huber, L. L., 214

Ichisaka, V., 42
 Inforzato, R., 283

Jacks, G. V., 2
 Jacob, K. D., 167
 Jacobs, S. E., 91
 Jameson, H. R., 191
 Jiménez Salas, J. A., 53, 54
 Johnson, A. C., 195
 Jones, F. G. W., 268
 Jordan, J. V., 391
 Joret, G., 330
 Joshi, K. G., 175
 Jung, E., 34

Keilin, D., 97
 Kephart, L. W., 203
 Killinger, G. B., 226
 Kipps, E. H., 14, 30
 Kirkwood, J., 124
 Kohnke, H., 160
 Kojima, R. T., 22, 23
 Kostava, G. A., 76
 Koutler-Andersson, E., 28
 Kozlov, V. P., 67
 Kurtz, T., 120

Laera, D. van, 174
 Låg, J., 338
 Landau, N., 179
 Lange, W. H., 194
 Larsen, J. E., 160
 Larson, C. A., 119
 Laubscher, F. X., 373
 Lawton, K., 11
 Lear, B., 197
 Lesch, W., 262
 Li, L. T., 357
 Liebig, G. F., Jr., 99
 Lindeberg, G., 90
 Littlejohn, L., 364
 Liu, H. P., 345, 350

Livera, E. J., 308
 Liwerant, J., 295
 Loosjes, A., 134
 Lorenz, O. A., 238
 Louis, L., 404
 Loustalot, A. J., 285
 Love, K. S., 161
 Lu, F. H., 348, 353, 359
 Lucas, E. H., 201
 Lucas, R. E., 136
 Lüdecke, H., 267
 Lukker, C., 389
 Lynch, P. B., 397
 Lynn, C. W., 370

Ma, Y. T., 349, 350
 McClymonds, A. E., 390
 McCool, M. M., 225
 McDonald, J., 365
 McGeorge, W. T., 18, 49
 MacGregor, J. M., 215
 McHenry, J. R., 220
 MacIntire, W. H., 165
 McMurtrey, J. E., Jr., 272
 Mader, E. O., 80

Madhok, M. R., 61
 Makarov, D. A., 74
 Malterre, H., 330
 Marsden, A. W., 91
 Marsh, T. D., 251
 Marshall, T. J., 70, 71
 Mathews, O. R., 118
 Mathison, I., 329
 Mattson, S., 28
 Maxim, I., 343
 Meadly, G. R. W., 204
 Meagher, W. R., 135
 Mehta, K. M., 63
 Meldrum, H. R., 210
 Melhus, I. E., 181
 Melichar, J., 108
 Menezest, F. G. T., 169
 Meredith, C. H., 101
 Meredith, D., 170
 Merrill, L. P., 385
 Meyer, C., 176
 Miles, R. O., 150
 Millar, C. E., 113, 324
 Miller, C. D., 404
 Miller, J. M., 396
 Miller, W. L., 303
 Millikan, C. R., 166
 Mitchell, J., 143
 Mitchell, J. H., 138
 Mitchell, J. W., 148
 Mitchell, R. L., 45, 46
 Mukerji, B. K., 15
 Mukerji, P., 15
 Mukherjee, S. K., 9, 73
 Murphy, H. C., 181
 Musgrave, G. W., 81
 Musser, R. H., 387
 Mysak, S., 109

Naftel, J. A., 146
 Nelson, C. E., 119
 Nelson, L. B., 159, 210
 Newhall, A. C., 196
 Nicholas, D. J. D., 239, 321
 Nickell, L. G., 103

Nijhawan, S. D., 64
 Nissen, O., 234
 Norman, A. G., 51
 Nutt, G. B., 115

Ødelien, M., 223
 Ojala, E. M., 402
 Owen, G., 25
 Owen, O., 173

Paauw, F. van der, 21, 29
 Paden, W. R., 243
 Pallmann, H., 60
 Parker, F. W., 158
 Partridge, N. L., 114
 Patrick, A. L., 382
 Payne, M. G., 200
 Pearson, G. E., 49
 Peech, M., 44
 Peele, T. C., 115
 Peiris, A. J. C., 363
 Pendleton, H. L., 79
 Penny, N. M., 231
 Petersson, G., 339
 Petherbridge, F. R., 268
 Pfeil, E., 267
 Pierre, W. H., 163, 210
 Pillsbury, A. F., 66
 Plice, M. J., 16
 Poehlman, J. M., 388
 Porter, R. H., 182
 Portères, R., 369
 Powers, W. L., 391
 Prasad, V. N., 63
 Price Jones, D., 269
 Pritchett, W. L., 159

Quastel, J. H., 93
 Quinn, N. R., 320

Rankin, W. H., 209
 Ratray, J. M., 229
 Rietberg, H., 266
 Renard, P. J. J., 122
 Richardson, H. H., 195
 Riehm, H., 52
 Roberts, R., 192
 Roberts, R. H., 121
 Roberts, W. O., 151, 179
 Robinson, R. R., 221
 Rodrigues, G., 78, 394
 Rogers, D. W., 173
 Roll-Hansen, J., 154
 Roseau, H., 129
 Rosevear, D. R., 4
 Ross, W., 404
 Rost, C. O., 77

Sa'aid, M., bin Sheik Daūd, 271
 Sabnis, C. V., 169
 Safta, I., 344
 Salgado, M. L. M., 309
 Sammet, K., 262, 267
 Sanford, B. G., 375
 Sarojini, T. S., 183
 Saunders, A. R., 373
 Savage, E. F., 296
 Scarseth, G. D., 136
 Scheys, G., 125
 Schollenberger, C. J., 12

Schönfield, S., 236
 Schrader, R. H. S., 307
 Schuffelen, A. C., 134, 140
 Scott, L. B., 217
 Scott, R. O., 46
 Seem, B. L., 214
 Sell, H. M., 201
 Sellschop, J., 288, 304
 Selman, I. W., 193
 Semeniuk, G., 101
 Sen, A., 9, 73
 Senb, G., 27
 Shavrygin, P. I., 38
 Shear, C. B., 137
 Sherwood, F. W., 224
 Simon, M., 263, 264, 265
 Singh, B. N., 105
 Skillman, E., 328
 Skripkina, A. A., 316
 Sloan, W. J. S., 257
 Smith, A. M., 8
 Smith, F. W., 261
 Smith, J. D., 97
 Smith, R. M., 102
 Snyder, R. S., 240
 Sobolev, S. S., 335
 Spinks, J. W. T., 143
 Stalé, J., 276
 Stall, J. B., 386
 Stamp, L. D., 327
 Stanton, W. R., 317, 321
 Stark, A. L., 294
 Stark, F. L., Jr., 197
 Steckel, J. E., 233
 Steinberg, R. A., 277
 Stewart, A. B., 133

Stieglitz, C. R. von, 398
 Stöckli, A., 69
 Stokes, W. E., 384
 Stout, G. J., 56
 Strickland, A. H., 107
 Sung, T. C., 345, 351, 352
 Swanson, C. L. W., 360

Tendeloo, H. J. C., 141
 Terlikowski, F., 207
 Thom, C., 86
 Thomas, F. J. D., 191
 Thorne, D. W., 144, 294
 Tisdale, W. B., 305
 Tissot, A. N., 305
 Tolhurst, J. A. H., 284
 Tompos, A., 98
 Tondeur, G., 371
 Toth, S. J., 26
 Trocmé, S., 33
 Tsiurupa, I. G., 37
 Truog, E., 14
 Trutnev, A. G., 316
 Tsvetoukine, M., 178
 Tubbs, F. R., 279
 Turfitt, G. E., 36
 Turk, L. M., 114
 Tyner, E. H., 62

Ukil, A. C., 73

Vanderwaeren, J., 263, 265
 Van Overbeek, J., 205
 Vélez, I., 205
 Vervelde, G. J., 141
 Vessel, A. J., 248

Villiers, O. de Hotman de, 156
 Virtanen, A. I., 96
 Vogler, E., 222
 Vogt, T., 336
 Vogt, W., 377, 378

Wallace, T., 239
 Wang, W. K., 356
 Ward, F. N., 167
 Warner, J. D., 384
 Waterer, R. R., 123
 Watson, D. J., 131
 Watson, J., 273
 Weidemann, A. G., 113, 213, 230
 Werner, H. O., 237
 Whiteside, A. G. O., 375
 Wightman, G. M., 379
 Wilcox, J. C., 290, 291
 Williams, C. H. B., 395
 Wilson, C., 306
 Wimmer, G., 262
 Winsor, H. W., 302
 Winterberg, S. H., 165
 Wolf, B., 42
 Woodhouse, W. W., 224
 Woodward, R. C., 191
 Wooley, J. C., 84
 Wraight, J. D., 246

Yee, J. Y., 161
 Yogeswari, L., 183
 Yu, T. J., 354

Zimmerman, P. W., 202
 Zook, L. L., 220
 Zwart Voorsuij, A. J., 141

SOILS AND FERTILIZERS

Vol. XI

1948

No. 2

RECENT STUDIES IN PHOSPHATE FIXATION ✓

Recent work on phosphate fixation in soil has been concerned with the following questions: (1) the relative importance of the clay minerals and of the Fe and Al compounds of the soil in P fixation at different pH values; (2) ionic exchange and fixation; (3) fixation by organic matter and micro-organisms.

(1) *Clay minerals, Fe and Al.* Black⁽¹⁾ produced evidence that hydroxyl groups within the non-expanding lattice of kaolinite, as well as those exposed outside, are replaced by phosphate. Fixation was at a maximum when the mineral was finely ground and at pH 3.5-4, and P was not fixed to a major extent as Al phosphate when the clay was decomposed by the acid phosphate applied. Fixation by kaolinite is greatest in the high P concentrations found near to a fertilizer particle, for example, but fixation by free oxides of Fe and Al is much greater, especially in dilute phosphate solutions⁽²⁾.

Coleman⁽³⁾, using the clay fractions extracted from soils, suggested that an apparent fixation by clay minerals after removal of Fe and Al might be due to failure to remove the Fe and Al compounds completely. The coarse clay fractions did not fix phosphate. The fine clay (0.2 μ), both kaolinitic and montmorillonitic, came to a rapid equilibrium with phosphate at pH 5-7, but below pH 5 fixation increased considerably with time. Perkins⁽⁴⁾, using powdered pure minerals, found that montmorillonite fixed about five times as much as kaolinite and, unlike all other minerals studied, showed a minimum of fixation (at pH 4.5-2). Kaolinite fixed much more at pH 3 than at pH 7 and 9.5, whereas montmorillonite absorbed about equal amounts at these levels.

Mica minerals, especially those in which one structural Si is replaced by one Al, are very active in fixation⁽⁵⁾. The space lattice

of muscovite expands when phosphate is fixed⁽⁶⁾. Perkins and King⁽⁷⁾ recorded that, with decreasing particle size of mineral separates, fixation increased on a weight, but decreased on a surface-area, basis. The increase was very rapid with most minerals in the 10-1 micron range.

(2) *Ionic exchange and fixation.* Ca permutite and Ca, K and NH₄ montmorillonites sorb considerable amounts of PO₄ from alkali-phosphate solutions of similar concentration to that of soil solution, but at higher concentrations both anion and cation are sorbed in amounts proportional to the concentration⁽⁸⁾. Barbier *et al.*⁽⁹⁾ found that a Ca clay, but not a K clay, rapidly turned much of the P of monocalcium phosphate out of solution, in the form of Ca-clay phosphates at concentrations too low for Ca phosphate to be precipitated. These compounds, which are easily broken down by a change in the equilibrium conditions, are believed to form an important part of the more easily available soil phosphorus. Exchangeable Ca has been indicated by Allison⁽¹⁰⁾ as retaining appreciable P in acid soils, in the H₂PO₄-Ca-micelle linkage, probably the most readily available of the "fixed" forms.

When a suspension of Fe(OH)₃ or of a podzol B horizon was mixed with soluble phosphate of similar pH, the pH of the mixture rose and large quantities of P became unavailable, appearing to indicate a physico-chemical exchange of exposed hydroxyl ions by phosphate ions⁽¹¹⁾.

Davis⁽¹²⁾, using a soil-Ca(OH)₂-water-air equilibrium system to simulate natural conditions, studied the solubility in various extractants of the phosphate fixed by the addition of FeCl₃ or AlCl₃. The phosphate retained by the Al-treated soil was more easily soluble than that retained by the

Fe-treated soil; the Fe and Al exerted their effect on fixation through the soil colloids and entered, to a large extent, the base-exchange complex. The Fe and Al ions which entered the original base-exchange positions of the soil were replaceable, but those which entered the base-exchange position created by the addition of phosphate were not⁽¹³⁾.

In studies of the fixation of P applied as H_3PO_4 to soils treated with $Ca(OH)_2$, Davis⁽¹⁴⁾ concluded that small additions of H_3PO_4 caused the formation probably of hydroxyapatite, and P was not adsorbed as an anion above pH 5, except at very low Ca concentrations. With increasing H_3PO_4 , primary or secondary Ca phosphates were adsorbed, increasing the cation-exchange capacity, which was largest when the amount of $Ca(OH)_2$ was least. With a large excess of $Ca(OH)_2$ some of the added P became adsorbed in the $CaCO_3$ form of tertiary Ca phosphate. In comparing the fixation of P added as H_3PO_4 or monocalcium phosphate, this author found that at soil reactions below pH 6.5 the amount of phosphate soluble in CO_2 -saturated water in the H_3PO_4 -treated soils was low, but, above pH 7, approached the amount in soil treated with monocalcium phosphate⁽¹⁵⁾.

Data obtained by Perkins and King⁽⁶⁾ indicate that fixation is related to the kind, amount and position of cations in the soil minerals. Most of the fixation is attributed to anionic Al (AlO_3^-), and small amounts to cationic Al or Mg, and possibly to OH.

Kurtz *et al*⁽¹⁶⁾ demonstrated that adsorbed phosphate in soil acted in some respects as an exchangeable anion replaceable by other anions in proportion to their ability to form stable complexes with ions in the clay mineral lattice. The fluoride ion had very high replacing ability, followed by oxalate, citrate and bicarbonate, while chloride, sulphate, thiocyanate, acetate and borate ions had very low replacing ability.

Dean and Rubins⁽¹⁷⁾ showed that different anions did not saturate a soil to the same degree, e.g., twice as much phosphate as arsenate was adsorbed. Hydroxide, fluoride and citrate, unlike arsenate, replaced all the

exchangeable phosphate. Replacement appeared easier with small anions, and that by citrate was thought not to be an exchange reaction.

Investigation of the effect of potassium salts on P fixation led to the following observations: The great increase in P adsorption on adding 2 per cent KCl solution produced no alteration of the shape of the adsorption curve which corresponded to the usual Freundlich equation: fixation is thus essentially an adsorption rather than a precipitation phenomenon⁽¹⁸⁾. The addition of K salts represses the hydrolysis of amphoteric phosphates, and this phenomenon is considered to be the main cause of reduced phosphate solubility after addition of potassium salts to soil⁽¹⁸⁾.

(3) *Organic matter, micro-organisms.* Laatsch⁽⁸⁾ found that the phosphate-fixing capacity of a Ca montmorillonite was much reduced by treatment with a neutral solution of K humate, and explained this as a result of the saturation by humic acid of the positive residual valencies of the mineral lattice.

Dunn⁽¹⁹⁾ observed a marked increase in fixation below, and a decrease above, pH 6 when organic matter was removed from several soil colloids. He attributed this to removal of organic-matter coatings around the particles of Fe and Al compounds.

The depth of penetration of monocalcium-phosphate solution into columns of soil was shown by Chaminade⁽²⁰⁾ to vary inversely with the humus content, whereas the amount of citric-soluble phosphate present after one week varied directly with the humus content. On adding monocalcium phosphate to a subsoil with and without added humus, 64 and 32% respectively of the added phosphate became insoluble in 1% acetic acid in one week. Chaminade presents evidence of the existence above pH 5.5 of phosphohumate absorption complexes soluble in neutral ammonium acetate⁽²¹⁾. These compounds are dispersible and ultra-filtrable, and enable phosphate to remain in suspension after centrifuging, at pH values at which it is almost completely insoluble, and their stability varies inversely with their phosphate content⁽²⁰⁾. In Neubauer analyses with

several soils, the addition of Ca humate or humic acid increased the root-soluble phosphate in natural and especially in heated soils (100 and 500°C.). Ca humate added to

pure Fe phosphate caused a large increase in the content of root-soluble, and humic acid a large increase in water-soluble, phosphate⁽²²⁾.

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- (14) Davis, F. L. Retention of phosphates by soils: III. Nature of phosphate retention of virgin Hammond very fine sandy loam treated with $\text{Ca}(\text{OH})_2$ and H_3PO_4 . *Soil Sci.* 60, 1945 (481-489).
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SUMMARY OF REPORTS

Reports received include: *Australia*, Report of the Council for Scientific and Industrial Research 1945-46; *Belgian Congo*, Rapport pour les Exercices 1944 et 1945, INEAC; *Canada*, Report of the Minister of Agriculture for the Dominion of Canada 1946-47; *National Research Council Review* 1946, Summary of 1945 Report of the *Dominion Experimental Station, Saanichton, B.C.*; *Colombia*, Informe del Departamento Nacional de Agricultura 1945; *East Malling Research Station*, Report 1946; *Edinburgh and East of Scotland College of Agriculture*, Report 1946; *Eire*, Report of the Minister for Agriculture 1945-46; *Nigeria*, Geological Survey Department Report 1946; *North of Scotland College of Agriculture, Aberdeen*, Report 1946; *Oxford Imperial Forestry Institute*, Report 1945-46; *Queensland*, Report of the Department of Agriculture and Stock 1946-47; *Switzerland*, Eidg. Landwirtschaftliche Versuchsanstalt, Zurich-Oerlikon, Report 1942-46; Stations Fédérales d'Essais Viticoles, Arboricoles et de Chimie Agricole, à Lausanne et à Pully, Rapports 1946; *United States Agricultural Experiment Stations*. *Georgia*, 1945-46; *Mississippi*, 1945-46; *North Carolina*, 1946; *Pennsylvania*, 1946-47.

Australia.—*Soil surveys* and investigations of relationship of soil type to land use; use of aerial photography in soil-survey work. Soil analyses for N content in connexion with cultivation and structure studies. Comparison of yields and relative copper content of herbage plants and the effect of NPK fertilizers. *Spectrochemical studies* of trace elements. *Soil-water relationships* on irrigated and non-irrigated sites; trials with tensiometer and electrical-conductivity methods. *Soil structure*; measurements of water-stable structure of soil aggregates on clean-cultivated and lucerne land. *Influence of Mo on symbiotic N fixation*. *Irrigation*; soil wastage under irrigation and analysis of soils for injurious salts; removal of subsoil water. Drainage and soil-reconditioning investigations on *rice fields*. *Guayule* growing on varying soils with and without irrigation.

Belgian Congo.—*Oil palm*; mineral and organic fertilizers; mixed cropping with

coffee. Shading of *coffee*. Establishment of *cacao* in burnt or cleared forest with natural or artificial shading. *Cotton*; rotations and fallows.

Canada.—*Report of Minister of Agriculture.*—*Soil micro-organisms* in relation to Mn deficiency; soil inoculants and stimulants and development of bacteria in peat. Rhizosphere effect in relation to bacterial nutrition. *Soil chemistry*. Rapid soil tests and laboratory methods for determining available plant-food constituents; methods of foliar diagnosis; methods of separation of organic matter from the mineral fraction; methods for determination of adsorbed phosphates and the part played by hydrated oxides of Fe and Al in adsorbing phosphates and their release by the fluoride ion. Determination of long-time effect of adding manure, muck, peat and plant remains on the chemical composition and physical properties of soil. Fertilizer value of ammoniated waste-sulphite liquor product of paper manufacture. Effect of fertilizers and legumes on grey wooded soils low in organic matter. *Effect of depth of soil moisture* on crop yields. *Brown-heart disease of turnips*; boron and soil reaction.

National Research Council Review.—Effect of soil conditions during winter on survival of soil-borne pathogens. *Steam sterilization of soils*; growth curves of *Rhizobia* in sterilized and unsterilized humus. Action of *connected-track shoes or wheels* on different soil types.

Experimental Station, Saanichton.—Effects of sod mulch, hay mulch and clean cultivation on apples, peas and grapes. Fertilizers for strawberries, beet, leek, radish, oats. Fertilizer response in different latitudes.

Colombia.—*Cacao*; growth substances and root stimulation of slips; cultivation and fertilizers with and without irrigation.

East Malling.—*Physiological effects of trace elements*; injecting aqueous solutions of $MnSO_4$ into potato leaflets to counteract Mn deficiency. *Diagnostic plant injection*. Boron deficiency of apples.

Nigeria.—Recent erosional history of the Kaduna Valley.

Imperial Forestry Institute, Oxford.—Relationship between tree growth and soil complex, moisture, porosity and pH. Isolation and identification of mycorrhizal fungi; effects of variations in biological characteristics of soils on metabolism of mycorrhizal fungi.

Queensland.—*Potatoes*; K and N deficiency. *Maize*; value of ploughing-under maize stalks. *Lucerne*; effects of P, gypsum, S and K. *Tobacco*; restoration of productivity of soils; rotations with Rhodes grass, lucerne and weed-grass fallow.

Edinburgh and E. Scotland College of Agriculture.—*Fertilizers*; liming experiments; relative values of super., silico-phosphate and mineral phosphate on deficient soils. *Sugar-beet*; response to N, P, K, Na and B.

North of Scotland College of Agriculture, Aberdeen.—Control of tomato-root eelworm; weed eradication.

Eidgenössische Landwirtschaftliche Versuchsanstalt.—*Problems of newly cultivated lands*; applications of basic slag, bone meal and rock phosphate. Lysimeter experiments on the *nitrogen economy of soils*. Decomposition and humification of manure, green manures and litter.

Stations Fédérales d'Essais Viticoles, Arboricoles et de Chimie Agricole.—*Soil disinfection*. *Microbial symbiosis* in Leguminosae; effect of mineral fertilizers on nitrifying bacteria. *Weedkillers*. *Fertilizers*

for trees and grass; application of P to vine soils rich in available P; comparison of $\text{Ca}(\text{NO}_3)_2$, basic slag, bone meal and complete fertilizers on pastures; fertilizers for calcareous soils. *Foliar diagnosis* of nutrient deficiencies.

United States Experiment Stations

Georgia.—*Cotton*; Root-knot resistance of crops in cotton rotations; gypsum and sodium sulphate in fertilizers for soils deficient in S; liming materials and rates of application. Sources of phosphates for pastures. Organic matter in soil under permanent pasture. Weed control with fumigants.

Mississippi.—Comparison of anhydrous ammonia and ammonium nitrate as source of N for maize, cotton and sorghum. *Soil physics*; use of a sampling cylinder for transferring field specimens to the laboratory for determining porosity. *Cotton*; effect of N, P, K and Ca on length and strength of fibre.

North Carolina.—*Maize*; effect of N fertilizers on protein content and yield; soil treatment for root worm. *Peanuts*; P and K applications with continuous peanut cultivation; Ca needs of soils high in organic matter; fertilizers for cotton in rotation with peanuts. *Tobacco*; effect of ~~chlorine~~ on quality. *Weed control* with urea and cyanamide. Physical and chemical properties of soil in relation to liming materials.

Pennsylvania.—Tobacco fertilizing with stockyard manure. Breakdown of soil structure under irrigation. Damping-off in over fertile seedbeds.

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages. Where the Bureau has only seen an abstract, and not the original paper, no language indication is given.

Original (untranslated) titles of papers are only given where the Latin script is used.

Where more than one reference is given, the first is to the original paper, the others to notices in abstract journals. A key to the abbreviations used in the references is contained in the Bureau's *Bibliography of Soil Science, Fertilizers and General Agronomy*.

551.5 METEOROLOGY

[405] 551.577-53
CHEMICAL AND ENGINEERING NEWS. **Langmuir announces new rain propagation theory.** *Chem. Engng. News* 25, 1947 (3568-3569).

While the dry-ice or silver-iodide methods of producing rain are effective only in super-cooled clouds, rain propagation in which ordinary water is dropped into actively growing cumulus clouds initiates a chain-reaction rainfall at any temperature above or below freezing point.

[406] 551.577-53
FARMER'S WEEKLY. **Artificial rain unlimited.** *Farm. Week. S. Africa* 74, Dec. 10, 1947 (55).

The fear has been expressed that if artificial rainmaking becomes popular it may result in some regions being deprived of part of their natural rainfall. It is pointed out, however, that artificial rain can only be produced where the necessary moisture is already present in the atmosphere, but the natural conditions are not conducive to precipitation.

[407] 551.577-53
SMITH, Y. **Inch of rain caused by man. Successful climax of experiments in Transvaal.** *Farm. Week. S. Africa* 74, Dec. 3, 1947 (99).

One inch of rain was caused over an area 3 miles × 1 mile with lighter rain over surrounding districts by dropping dry ice into cumulus clouds from 5000 feet above the clouds.

[408] 551.577-53
BANNON, J. K. **Artificial stimulation of rain formation.** *Met. Mag.* 76, 1947 (169-174).

Australian experiments are described in which granulated CO₂ was dropped on isolated cumulus clouds for the production of rain. The probable mechanism of the changes brought about are described, and it is pointed out that tropical or warm climates will be more favourable than temperate climates for carrying out such experiments. The Moscow press has reported that physicists at the University of Odessa have caused rain to fall from clouds by dusting them with CaCl₂ powder.

[409] 551.577-53
MAURAIN, C. **Sur les essais relatifs à la pluie artificielle. [Artificial rain experiments.]** *C.R. Acad. Agric.* 22, 1947 (618-620). [F.]

An outline discussion of the processes concerned in rainmaking from clouds.

632.3 AGRICULTURAL EQUIPMENT

(See also Abs. Nos. 442, 486).

[410] 631.312
WAN, H. C. **Comparative mechanics of the plough.** *J. Agric. Assoc. China Suppl.* No. 50, 1945 (52).

The Chinese plough (as represented by the Szechuan plough) is compared with the modern western plough. It is found to be 5% less in speed and over 50% less in efficiency. The old-fashioned Chinese plough uses less material to build and less driving force but requires more skill in handling.

[411] 631.312.5
HINES, R. C., Jr.; LILLARD, J. H., Jr.; EDMINSTER, T. W. **Applying stubble-mulch tillage in Virginia.** *Agric. Engng.* 28, 1947 (507-508). [Va. Agric. Expt. Sta.]

An account is given of trials with new and conventional mulch-culture tools in order to devise suitable methods of applying the principle of mulch tillage to Virginia farming methods. Crop yields increased with increasing thoroughness of subsurface cultivation, that given by rippers and combinations of rippers and disc and tredders giving highest yields.

631.4 SOILS

[412] 631.4:537-533
JACKSON, M. L.; MACKIE, W. Z.; PENNINGTON, R. P. **Electron-microscope applications in soils research.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (57-63). [Univ. Wisconsin, Madison]

Processes of dispersion, flocculation, orientation, grinding, alteration of minerals by weathering and the natural microflora can be studied by means of the electron microscope.

[413] 631.4:549
JEFFRIES, C. D. **Some developments in soil mineralogy.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (16-18).

A brief discussion of developments in mineral identification, X-ray and thermal analyses, and the use of the electron microscope.

[414] 631.4:551.311.12
GOODMAN, K. V. **Stratigraphy of the soils of the glacial outwash, York County, Maine.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (452-457).

The soils are divided into 3 main groups distinguished primarily according to the size of separates (which range from silt to large boulders) and the colour of the deposits.

631.41 SOIL CHEMISTRY

(See also Abs. Nos. 432, 434, 498, 626, 687).

[415] 631.414.2:549
MACÉWAN, D. M. C. **Les minéraux argileux de quelques sols Écossais. [Clay minerals in some Scottish soils.]** *Verre Silicates Indust.* 13, 1948 (41-46).

Results are given of clay-mineral analysis of three podzolic soils. A feature to which

attention is directed is the presence of biotite-like minerals in the clay fraction. These generally take the form of materials resembling hydrobiotite and vermiculite, at least in so far as they are not appreciably affected by treatment with glycerol. Apart from these, kaolinite, hydromicas and hydrated oxides of iron and aluminium appear to be of general occurrence. True montmorillonite has not been found, nor have any of the hitherto described members of the montmorillonite series.

[416] 631.414.2:549.623.9
PERKINS, A. T. **Structure of kaolin and related minerals.** *Trans. Kans. Acad. Sci.* 50, 1947 (208-215). [Kans. State Coll., Manhattan]

A brief outline of the classification of pyroxene, amphibole, clay, mica and feldspar minerals is given. To differentiate between kaolin and montmorillonite, the former is classified as a monosilicon aluminate and montmorillonite as a disilicon aluminate.

[417] 631.414.3:546.19
HÉBERT, J.; BOISCHOT, P. **Fixation de l'arsenic par les sols. [Arsenic fixation by soils.]** *C.R.* 225, 1947 (1179-1181). [F.]

Soluble arsenates in concentrations below 10 mg./litre of As_2O_3 were rapidly fixed by clay, but with higher concentrations only $\frac{1}{4}$ was fixed rapidly and the remainder quite slowly, so that heavy applications may pass to the drainage water. This risk applies also to the less soluble arsenates (Pb, Ca), when applied to soils with insufficient clay, especially if the soil is acid or decalcified.

[418] 631.414.3:631.436.5
HOVDEN, A. A. **Thermal stability of soil-forming materials.** *Meld. Norg. Landbr-Høgsk.* 27, 1947 (272-314). [E.]

The acid- and base-binding properties of an American bentonite, two Swedish clays, the B horizon of a podzol, kaolin, bauxite and a laterite from Puerto Rico were determined electrometrically after heating to various temperatures up to 1000°C. The laterite and podzol were "basoid," the others "acidoid" in character.

Heating caused a marked increase in the acid-binding capacity of all the materials. The maximum acid-binding capacity was reached at a temperature that was related

to the temperature of dehydration of the material concerned. Oxalate solubility of sesquioxides increased in a similar manner. Because fine grinding of the laterite also produced an increase in acid-binding capacity and sesquioxide solubility it is concluded that the phenomenon of "basoid activation" is essentially a surface phenomenon in which the principal role is played by sesquioxides.

The base-binding capacity of kaolin and laterite increased, and of the other materials decreased, on heating. Laterite activated by heating formed a complex with phosphate that had a very high cation-fixing capacity at high pH values.

[419] 631.415.3 : 631.432
MADOS, L. [Formation of szik soils and the role of water.] *Hidrol. Közönlöny* 23, 1943 (3-21). C.A. 41 (7607).

The level of soil water was always higher in alkali soils than in mineral soils during observations on the fluctuations of water levels in soil water wells. The fluctuation of water levels was more marked in wells bored in alkali soils. The lifting up of salts to the surface by soil-water movements and the leaching of soil in a medium containing alkali salt must be looked upon not as procedures contrary to each other, but as both acting simultaneously in the formation of alkali soils.

[420] 631.415.3 : 631.67
BONNET, J. A. Laboratory and field studies in an alkaline earth solonchak area of Puerto Rico to be irrigated. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (480-483). [Agric. Expt. Sta., Rio Pedras, P.R.]

Data, obtained with a view to determining the suitability of soils for irrigation, are presented on specific conductances, infiltration rates, the leaching effect of fresh water on the salt content of the soil, and the limiting conductivity ratios of soils producing the major crops of the island. The conductivity ratio is the conductivity of a 1:2 suspension of the first foot divided by that of the four-foot layer. A ratio of over 128/150 is detrimental to sugar cane. Soils with ratios below 172/234 can be reclaimed by simple leaching, those with higher ratios require treatment with sulphur or gypsum.

631.416 COMPOSITION OF SOILS

(See also Abs. Nqs. 452, 468, 517, 527, 529, 572, 616)

[421] 631.416.2 : 631.414.3
BARBIER, G.; CHABANNES, J. Sur la réversibilité de la fixation des phosphates dans le sol. [The reversibility of phosphate fixation in soil.] *C.R.* 225, 1947 (1178-1179). [F.]

In a slightly acid, decalcified clay the percentage of P_2O_5 easily extracted by dilute acid dropped in 5 years to $\frac{1}{3}$ of the total P_2O_5 incorporated, and stayed at this figure, the remainder being rapidly extractable by dilute alkali. Using dilute lime water instead of alkali, in sufficient quantity just to neutralize the soil, the alkali-extractable P_2O_5 did not pass largely into solution, but came into a form which was extractable by dilute acid.

[422] 631.416.2 : 631.414.3
BARBIER, G.; CHABANNES, J. Sur la réversibilité de la fixation des phosphates dans le sol. [The reversibility of phosphate fixation in soil.] *C.R. Acad. Agric.* 33, 1947 (735-738). [F.]

The presence in soil of a rapidly fixed form of P_2O_5 soluble in dilute acid (0.002 n. H_2SO_4) and of a slowly fixed form derived from the former and soluble in dilute alkali ($Ca(OH)_2$ solution or 0.002 n. KOH) makes necessary the use of both acid and alkaline extractants in evaluating the assimilable P reserves of soils.

[423] 631.416.2 : 631.414.3
PAPADAKIS, J. S. Experiments on the immobilization of phosphorus. *Soil Sci.* 64, 1947 (365-369). [Inst. Pl. Br., Salonica, Greece]

Micro-organisms and crop residues were shown to play an important part in the immobilization of P fertilizers. Sodium phosphate when added to the soil after having been dissolved and absorbed by straw, depressed wheat yields (in pots) as compared with the yields obtained when P was added directly to the soil. The yields were lowest when the straw had absorbed N as well as P, and thus was in a fit state for active decomposition. This decrease in yields cannot be ascribed to immobilization

of N by the addition of straw, as the decrease should have then been greater with larger applications of P_2O_5 and corresponding larger additions of straw, which was not the case. The effectiveness of phosphate was depressed by a preceding crop of wheat as compared with fallowing and to a lesser degree by a preceding legume crop. Glucose added to the fallow depressed the subsequent yield with the larger applications of phosphate, but not with the smaller. Green-manure applications had a similar effect.

[424] 631.416.2 : 631.414.3 : 539.16
NELLER, J. R.; COMAR, C. L. **Factors affecting fixation of phosphorus in soils as determined with radioactive phosphorus.** *Soil Sci.* 64, 1947 (379-387). [Fla. Agric. Expt. Sta.]

Solutions of mono-potassium phosphate plus radioactive P were added to nine contrasting types of soil, and samples were dried at room temperature, at 40°C. and at 100°C. The percentage of P retained against a sodium acetate-acetic acid extracting solution was the same irrespective of method of drying. In sandy soils the chemical method of determining extractable P gave values somewhat higher than those obtained by the isotope technique. The two methods were in close agreement for loam and clay soils. The radioactive method was adopted as standard procedure, since it permits quantitative estimation of P independently of that previously in or added to the soil. In equilibrium solutions of soil and sodium acetate-acetic acid extracting solutions containing soluble phosphate there was a progressive decrease in percentage of P retained as the concentrations were increased through a range of 50 to 450 p.p.m. This decrease in fixing power was greatest in sands and least in loams and clay. When the soils were dried after additions of solutions of soluble phosphate the percentage fixed was greater than when the phosphate was added in the extracting solution, the increases ranging from 58.2% for Norfolk fine sand to 11.1% for Coxville clay. The fixing power of the soils for P against a dilute acid extractant was directly related to their clay contents. Fixation varied directly with the moisture equivalent of the soils and to a lesser degree with their silt and organic matter contents, but there was no correlation with pH values.

[425] 631.416.2 : 631.414.3 : 546.19
SCHOLLENBERGER, C. J. **Arsenate-displaceable phosphate in long-fertilized and unfertilized plot soils.** *Soil Sci.* 64, 1947 (371-378). [Ohio Agric. Expt. Sta., Wooster]

Analytical methods developed for extracting soils with arsenic acid-ammonium arsenate solutions in a range of pH values, and data on phosphoric acid thus displaced from long-fertilized and unfertilized plot soils are presented. Soil from superphosphated plots was higher in arsenate-displaceable P_2O_5 than was unfertilized soil, but the differences were small compared with the absolute amounts displaced. Recoveries of a known addition of phosphate ranged between 20 and 70%. These, as well as the absolute amounts displaced, were minimum at pH 4-5 and maximum at the highest value included, pH 7. Extraction with neutral ammonium arsenate displaced between 15 and 27% of the total P_2O_5 in the soil. Only a small amount of organic matter was contained in the extracts, and the amount of P in organic combinations therein was shown to be negligible. The marked effect of pH upon the arsenate displacement is considered to be evidence that a ferric phosphate or similar complex may be present in the soil. There was no significant displacement of phosphate by an acetate anion, and the direct solvent effect of the hydrogen ion at pH 3 was slight. The results suggest that the observed effect of liming in increasing the utilization of the native soil P_2O_5 as well as that added in the form of super. is largely from the increase in the pH value of the soil.—Author's summary.

[426] 631.416.2 : 631.432.3 : 631.435.1
NELLER, J. R. **Mobility of phosphates in sandy soils.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (227-230).

In lysimeter experiments, super. or calcined phosphate at 300-1250 lb./acre was mixed into the 0-4-inch layer of the surface 8 inches of (a) Leon fine sand and (b) sandy loam soils. 25.8 inches of rain fell in the period May-September. The leachates from (a) and (b) respectively contained 79.1 and 1.6% of the citric-soluble P applied as super., and 82.9 and 1.6% of that applied as calcined phosphate.

15 and 60 days, when the P_2O_5 was extracted with 2% citric acid and estimated. Results were similar to those obtained by the Neubauer method.

[438] 631.417.2 : 631.416.2
CHAMINADE, R. ; VISTELLE, R. Contribution à l'étude expérimentale du rôle de l'humus dans les sols. Influence de l'humus sur la mobilité de l'acide phosphorique dans les sols. [Contribution to the experimental study of the function of humus in soils. Influence of humus on the mobility of phosphoric acid in soils.] *Ann. Agron.* 17, 1947 (536-544). [F.] [Ecole Nat. Hort., Versailles]

Samples of soil of various known humic-acid content were washed on a filter by solutions containing from 200 γ to 2,005 γ per litre of mono-Ca phosphate. Analysis of the percolate in 50-c.c. fractions showed that fixation of P_2O_5 rises to a maximum and then falls in successive fractions. This was probably due to dissociation of the absorption compounds of clay or humus and P_2O_5 in the acid-phosphate solutions after the lime reserves had been utilized. At concentrations above 200 γ per litre of P_2O_5 the amount fixed increased with increasing amounts of humus in the soil.

A solution of mono-Ca phosphate was allowed to percolate through columns of soil which were then dried at 50°, cut into lengths and examined for total and available P, using hot HNO_3 and 2% citric acid respectively. The depth of penetration of P decreased with increasing humus content of the soil. The amount of citric-soluble P after a week was higher in soils with a high humus content.

[439] 631.417-748.3
FULLER, W. H. Investigations on the separation of uronides from soils. *Soil Sci.* 64, 1947 (403-411).

Attempts were made to separate uronides from the other constituents of 2 loamy soils, a muck and maize-stalk composts by extraction with cold 1% Na_2CO_3 ; cold 1% NaOH; 0.5% ammonium oxalate at 80°C.; and acetyl bromide at 40-50°C. for 3 days. The quantity of uronic C extracted by the cold treatments was proportional to that of the non-uronic C, namely $\frac{1}{2}$ - $\frac{1}{3}$ of that originally present, but there is evidence that

the hot treatments dissolved out a slightly greater proportion of the non-uronic C of soils.

The ratio uronic C : total C of the extracts was very similar to that of the corresponding residues, but the sum of the uronic C in an extract, together with that in the corresponding residue, was often slightly lower than that in the original material, especially with strongly alkaline extractants. The decarboxylation rate of the uronic units of both extracts and residues resembled that of the uronic constituents of the original materials.

[440] 631.417-748.3
FULLER, W. H. Evidence of the microbiological origin of uronides in the soil. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (280-283).

The decarboxylation rate of polyuronide gums and mucilages from plants, of bacterial gums, of fresh and decomposed alfalfa residues and of soil organic matter was measured on boiling with 12% HCl. Soil organic matter, decomposed alfalfa and bacterial gums all showed an initial rapid rate of decarboxylation followed by a much slower rate. The plant gums and undecomposed alfalfa showed a slower initial rate followed by a more gradual fall. These findings support the view that the CO_2 -yielding constituents in soil are uronic and of microbial origin.

[441] 631.417-748.3 : 631.58
FULLER, W. H. Influence of some cropping and fertilizing practices on the uronides of soil. *Soil Sci.* 64, 1947 (435-444).

The uronic-C/total-C ratio and the decarboxylation rate of the uronic units in the surface soil of nine soil types which had been either under a stable crop rotation or under the same crop for 25 years, differed to a greater degree among different soil types of like cropping history than among samples of one soil type of unlike cropping histories. Uronic-C content varied closely with total-C content, the ratio changing only slightly as a result of different cropping and fertilizer treatments, but as the original C of a soil became reduced by cropping, especially by continuous maize cropping, total organic C tended to fall more rapidly than uronic C.

631.42 TECHNIQUE AND ANALYSIS

(See also Abs. Nos. 423, 425, 430, 485, 668)

[442] 631.42 : 631.84 : 634.31
 HERRERO DE EGAÑA, M. Preparación de una experiencia sobre fertilizantes nitrogenados, en el abonado del naranjo. [The preparation of an experiment on the nitrogen fertilizing of oranges.] *Bol. Inst. Investig. Agron. Madrid* No. 16, 1947 (189-210). [Sp.]

A discussion of the difficulties peculiar to such experiments with fruit trees. To obtain the maximum uniformity in plant material, the stocks used were selected from the asexual progeny by polyembryony of a single bitter-orange tree, and the Washington Navel orange buds for grafting were taken from 4 trees similar in age, development and production. Further stages in selection (reducing variability of the material to less than 10%), the numbering of the plants, and the planning and fertilizing of the plots are shortly described.

[443] 631.42.005
 NIELSEN, J. L.; WEST, B. G. General purpose soil auger. *Colo. Farm Bull.* 8, 1946 (2, 15). *Biol. Abs.* 21 (1766).

Experiments indicate that a single-twist ship auger of $\frac{3}{4}$ - or 1-inch diameter is best for general purposes. It is ground off and the point sharpened to an angle of 30°. The shaft of the bit is welded to $\frac{1}{4}$ -inch, heavy-duty water piping of suitable length.

[444] 631.42.005
 LUTZ, J. F. Apparatus for collecting undisturbed soil samples. *Soil Sci.* 64, 1947 (399-401). [N.C. Agric. Expt. Sta.]

Two devices are described. The first consists of a cylinder into which small cans are fitted, but with about $\frac{3}{8}$ of an inch of the open end of the can exposed, this serving as a cutting edge. A piston is used for pushing out the full cans. A washer-type ring is welded around the outside, flush with the bottom of the piston. In sampling, when this ring touches the soil surface the can is full. The handle is a $\frac{1}{2}$ -inch pipe and can be made any desired length. The cans used are of seamless tin, $2\frac{3}{8}$ inches in diameter and $1\frac{5}{8}$ inches high. A small hole is drilled in the bottom of each. The sampling operation consists of smoothing the surface, pushing the sampler into the soil until the ring

touches the surface, spading the device out with a small garden spade, cutting the exposed surface smooth with a knife and covering with the can lid. The entire operation for one sample requires only about a minute. For permeability determinations another sampler was made in which cylinders were used instead of cans. The cylinder apparatus is similar to the first, but has a different arrangement for holding the cylinder, which is made of seamless steel, and has a removeable cutting edge of hardened steel.

[445] 631.422
 PEECH, M.; PLATENIUS, H. Tests of plants and soils. *U.S.D.A. Yrbk.* 1943-1947, 1947 (583-591). [Cornell Univ.]

A discussion of the limitations and use of chemical soil tests, of plant-tissue tests, and the need for their further development and of the use of deficiency symptoms as a diagnostic method.

[446] 631.423 : 537.531
 GORBUNOV, N. I.; TSIURUPA, I. G. [X-ray determination of montmorillonite, kaolinite, quartz and gypsum in mixtures with amorphous silicic acid.] *Pochvovedenie* 1947 (555-567). [R.]

Tables are given of the position and intensity of clear interference lines on X-ray plates of (1) the individual minerals, (2) mixtures of the minerals in various proportions and (3) mixtures of the minerals with amorphous silicic acid in various proportions. With a 30-hour exposure, quantitative determination is possible of quartz (4% admixture in the amorphous substance) and gypsum (not less than 6%). 10% of kaolinite or montmorillonite in the silicic acid produced interference lines, but smaller proportions may be determined with a longer exposure. 10% of kaolinite in 90% of montmorillonite, or *vice versa*, is also determinable.

[447] 631.423 : 552
 JEFFRIES, C. D. A rapid method for the removal of free iron oxides in soil prior to petrographical analysis. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (211-212).

The method is to reduce the iron oxides with nascent H by the action of a buffer mixture of K oxalate and oxalic acid on Mg ribbon at 90-95°C. No insoluble oxalates

are obtained; the soil disperses readily for mechanical analysis and the separates are excellent for petrographic study.

[448] 631.423.3 : 631.416.327
RUSSELL, J. J. **The colorimetric determination of traces of boron.** *Natl. Res. Coun. Canada, Atomic Energy Project MC-47*, 1947, pp. 40.

A method which has been developed for the analysis of different types of materials, including soils, for traces of B relies on the distillation of B as methyl borate and its subsequent hydrolysis with NaOH solution. The B is determined by means of turmeric, using a Spekker absorptiometer to measure the colour.

[449] 631.423.3 : 631.416.4/5
ATTOE, O. J.; TRUOG, E. **Rapid photometric determination of exchangeable potassium and sodium.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (221-226).

Using the method described, the average errors in determining known additions of K and Na to the extracts of 10 soils were 2.2 and 2.1% respectively, and in the analysis of 8 soils for exchangeable K, there was a difference of 3.9% between the results by the photometer and cobaltinitrite methods. The use of an extracting solution composed of 2 n. NH_4 acetate and 0.2 n. Mg acetate eliminated the tendency to give low photometric readings for K and Na in solutions containing strong acids, bases and their salts or Ca and Mg salts, all of which raise the surface tension of the extract above that of the standard reference solution. The pH of the extract should be within the range 6.6-7.2.

[450] 631.423.3 : 631.416.4
VÁRALLYAY, G. [Flame-photometric determinations of potassium according to Nehring, Schachtschabel and Riehm.] *Mezőg. Kutat.* 17, 1944 (95-104). C.A. 41 (7602).

Riehm's method was the least suitable, since separation of the large quantities of Ca originating from Ca lactate is tedious and the solution obtained is very dilute in respect of K, making the measurement of galvanometer movements rather difficult. With the Nehring and Schachtschabel methods Ca, Mg and Na did not interfere with the deter-

mination of K if they were not present in too high amounts, and, if necessary, the addition of primary or secondary NH_4 phosphate prevents their interference.

[451] 631.423.3 : 631.416.7
RAMOS, B.H.M. [Colorimetric determination of calcium in the soil with chloranilic acid.] *Rev. Quím. Indust. Rio de J.* 16, No. 181, 1947 (19-20). C.A. 41 (7602).

The method is based on the colour change from rose to red. Precision is 0.1 mg. of Ca. 12 c.c. of a chloranilic-acid solution (2 gm. per litre) is placed in a centrifuge tube of 25-30 c.c., the solution containing the Ca is added, and the whole slightly agitated. To effect as high a concentration as possible the soil extract is evaporated to dryness after elimination of Fe, the residue is taken up with the least possible amount of water and completed to a certain volume. The precipitation is considered complete after 45 minutes' standing. After centrifuging, the precipitate is washed by adding the distilled water to the centrifuge tube and centrifuging at 2000 r.p.m. for 30 seconds. This is repeated three times. The water is siphon-washed out of the tube. Then with a burette 26 c.c. of a mixture of equal volumes of 10% H_2SO_4 (or HCl) and acetone are added to the precipitate in the tube. When the precipitate is dissolved the solution is transferred to a 100-c.c. flask, the tube is washed 2-3 times, filled up with distilled water and shaken quickly. The colour of an aliquot part is compared with a standard solution (12.5 gm. CaCO_3 dried at 100°, dissolved in dilute HCl and made up to a litre at 20°) in a colorimeter.

[452] 631.423.3 : 631.416.847
TAKAZAWA, F.; SHERMAN, G. D. **The polarographic determination of zinc in soil.** *J. Assoc. Off. Agric. Chem.* 30, 1947 (182-186).

For total Zn, the soil sample is fused with alkali carbonates, digested with HCl and filtered. Zn-free ammonium-citrate solution is added to the filtrate, together with concentrated NH_4OH until alkaline. The Zn is separated by extraction with a chloroform solution of dithizone, from which it is removed by shaking with HCl. The HCl solution is evaporated to dryness, the residue

is dissolved in a solution of ammonium acetate and potassium thiocyanate and is polarized between potentials of 0.8-1.2 volts at the dropping mercury electrode. The polarogram is compared with that for a standard Zn solution. For exchangeable Zn, the soil sample is extracted with ammonium acetate, the extract evaporated to dryness, the organic matter oxidized and the above procedure applied.

The method is as rapid as the colorimetric, and accurate to 1.5% over a range from 0.5 p.p.m. of exchangeable Zn to 310 p.p.m. of total Zn in soil.

[453] 631.423.3 : 631.811.4
BOISCHOT, P.; HÉBERT, J. Sur le dosage du calcaire actif des sols par la méthode à l'oxalate d'ammonium et son application au dosage du calcaire facilement assimilable des amendements. [On the estimation of active lime in soils by the ammonium-oxalate method and its application to the estimation of easily available lime in amendments.] *Ann. Agron.* 17, 1947 (521-529). [F.] [Sta. Cent. Agron., Versailles]

Drouineau's NH_4 -oxalate method was compared with that using CO_2 -saturated water. In 5 out of 6 samples both methods gave results of the same order, provided that the analyses were carried out under carefully controlled conditions. With the latter method, complete saturation of the water with CO_2 , maintenance of the ratio $\text{CaCO}_3/\text{water}$ at $< 0.1/500$ and a shaking time of 2 hours were necessary.

The NH_4 -oxalate method was investigated, using various limestones. With oxalate solutions at pH 1.2-3.0 the solubility dropped rapidly, but rose again to pH 8 where it became constant. A minimum shaking time of 4 hours was required. Solubility increased with decreasing particle size and was less for crystalline than amorphous samples. Variation of temperature from 12° to 28° had no effect, but results became variable if the ratio $\text{CaCO}_3/\text{solution}$ increased beyond 1/500.

[454] 631.423.3 : 631.811.4
VRIES, O. DE; BRUIN, P. Liming problems on light soils in the Netherlands. *Emp. J. Expt. Agric.* 15, 1947 (260-268). [Landb-Proefsta. Bodemk. Inst., Groningen]

The "lime factor" of the soil is the amount of lime, expressed in kg. of $\text{CaCO}_3/\text{ha.}$,

needed to increase the pH by 0.1 in a layer 10 cm. deep when all the lime is taken up by the humus. For determining the lime factor, 20 gm. of air-dry soil are mixed with 400 mg. of fine precipitated CaCO_3 in a 150-200 c.c. wide-necked flask; the mixture is stirred to a paste with water, left standing overnight at room temperature, stirred again and dried in an oven at 100°C. The bicarbonate formed is decomposed and the CO_2 removed. The unchanged carbonate is determined with HCl, the volume of CO_2 being compared with the amount evolved from a known quantity of pure CaCO_3 at the same room temperature and atmospheric pressure. This gives the amount of base, in m.e./100 gm. of soil, necessary to saturate the clay and the humus in contact with a surplus of CaCO_3 under the chosen conditions. From this T-S figure and from the S-figure determined by treating soil with 0.1 n. HCl, the base saturation T and the degree of base saturation V are calculated. For acid, sandy and peaty soils (pH < 6) 0.1 in pH corresponds with 2% in V. The lime factor is then found from the formula: lime factor = $10 T \times \text{volume weight of soil}$.

In liming prescriptions for experimental fields an extra allowance of $\frac{1}{4}$ of the amount of lime calculated from the lime factor and the pH to be reached is added to compensate for the lime that will rapidly disappear from the top soil or remain unused in the form of coarse and inactive particles.

[455] 631.423.4
WITKOWSKY, E. [Investigation of several methods for the determination of humus in soils.] *Mezőg. Kutat.* 15, 1942 (159-165). C.A. 41 (7602).

The following methods were compared: the KMnO_4 ; Dennstedt; Walkley and Black and its modification by Novák and Pelišek. Elementary analysis according to Dennstedt gave the most reliable and reproducible results. The KMnO_4 method was simple and rapid, but instead of 0.06 the factor 0.51 should be used for a 0.1 n. solution, and the method usually gives higher values than the Dennstedt method. Novák and Pelišek's modification seems to give more exact values (about 12% lower than by the Dennstedt method) than the original Walkley and Black method, which gave no reliable results.

- [456] 631.425.1
HARLOW, E. H. **Chart facilitates determination of unit weights of soils.** *Engng. News-Rec.* 139, 1947 (394-95). C.A. 41 (7603).

If any three of the seven major variables of a soil are known, all other relations may be read from the chart which is described.

- [457] 631.425.23
KIRKHAM, D. **Field method for determination of air permeability of soil in its undisturbed state.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (93-99). [Iowa Agric. Expt. Sta., Ames]

The mathematical theory of laboratory and field apparatus for measuring permeability is given, together with experimental details.

- [458] 631.425.31
BENDIXEN, T. W.; SLATER, C. S. **Effect of the time of drainage on the measurement of soil pore-space and its relation to permeability.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (35-42). [Maryland Agric. Expt. Sta., College Park]

Soil cores 4 inches in diameter and about 4 inches high (vol. = 1 litre) were held in a cylindrical casing to the bottom of which suctions up to 60 cm. of water could be applied. After wetting to saturation a 5-cm. head of water was maintained above the sample and percolation rates were measured over a period of 4 hours. Drainage curves were then plotted, first by increasing the suction in steps of 10 cm. held for half an hour each, and then, in later experiments, by applying a 60-cm. suction directly and plotting total drainage against time (up to 24 hours). For artificially packed soil cores the initial drainage rate was highly correlated with the permeability under a fixed head: for natural-structured cores the correlation was poor, but the amount of drainage after 1 hour put the soils in the same order as that of their percolation rates.—H.L.P.

- [459] 631.425.4 : 631.437.36
STOKKINK, G.; CANNIERE, J. de; FRIPIAT, J. **[Research on the phenomena of cataphoresis in soil suspensions. Physico-chemical method for the determination of the state of the soil structure.]** *Agricultura Louvain* 45, 1947 (88-100). C.A. 41 (7605).

A description of the circuit and cell used for mobility measurements is given. The curve expressing the mobility of a particle as a function of its height in the cell is made perfectly symmetrical to a line parallel to the vertical axis. Each curve is characteristic of the clay suspension. The parabolic curves do not change, even after the suspension has stood for 8 hours, and they may be employed to differentiate soil structures, as, for example, an ordinary soil and an inundated soil.

- [460] 631.425.5
ARIANO, R. **Determination of particle-size distribution of soils by sedimentation from suspensions.** *Ingegnere Milan* 20, 1946 (554-564, 611-615, 705-712). C.A. 41 (7601).

Theoretical considerations involving Stokes's law are given as a basis of particle-size determination by sedimentation methods. Size determination by sieving is critically investigated. The importance of deflocculating agents in the sub-sieve range when sedimentation methods are used is emphasized. The theory and operating methods of areometric and pipette analyses and their potential sources of error are surveyed. Further data on particle-size distribution of soils are given.

- [461] 631.425.5
RODRIGUEZ LOPEZ, E. **Técnica del análisis mecánico usado en "The Soil and Fertilizer Division U.S. Department of Agriculture" y consideraciones sobre su aplicación. [The technique of the mechanical analysis used in the Soil and Fertilizer Division U.S.D.A., and considerations on its application.]** *Rev. Fac. Agron. Univ. Montevideo* No. 44, 1947 (211-228). [Sp.]

- [462] 631.425.5
BOTVAY, K. **[A simplified method for the mechanical analysis of soils by the sedimentation balance of Miklós Vendl.]** *Mat. Term. Ért.* 62, 1943 (324-333). C.A. 41 (7601).

Particles of the soil sample smaller than 0.2 mm. are separated by a wet process on metal sieves, and only this fraction is analysed further by the sedimentation balance to determine fine sand 0.2-0.02 mm., silt 0.02-0.002 mm., and clay smaller than 0.002 mm.

[463] 631.425.5
CHEN, C. T. ; HUA, M. **Mechanical analysis of soils by means of a common hydrometer.** *Soil Sci.* 64, 1947 (389-398).

Particle-size summation curves determined by hydrometer and pipette methods for seven soils agreed sufficiently closely, when a modification in the time of reading suspension density was introduced, to justify the use of the hydrometer in mechanical analysis when a reasonable degree of accuracy is required.

[464] 631.425.5
VISSER, W. C. De karakteriseering van de granulaire samenstelling van gronden. [The characterization of the mechanical composition of soils.] *Versl. Landbouwk. Onderz.* 53, 7A, 1947 (263-308). [Du.e.]

[465] 631.427.2
TSCHAN, Y. S. Microbiologie du sol; une nouvelle technique de microscopie directe. [Microbiology of the soil; a new method of direct microscopy.] *Ann. Inst. Pasteur* 73, 1947 (695-696). [F.]

Part of the soil to be tested is placed in a petri dish and after incubation at 28°C. the top layer is transferred to a flamed slide and stained with phenicated erythrosine. This gives good differentiation of bacterial and fungal colonies, including actinomycetes.

[466] 631.427.2 : 631.466.1
WINTER, A. G. Eine Methode zur quantitativen Bestimmung des Wachstums parasitischer oder saprophytischer Pilze im natürlichen Boden. [A method for the quantitative estimation of the growth of parasitic or saprophytic fungi in the soil.] *Biol. Zentralanst. Land- und Forstwirtschaftschr. Otto Appel* 1947 (12-15). [G.] [Plant Path. Inst., Univ. Bonn]

The growth of the saprophytic phase of *Ophiobolus graminis* has been investigated in natural and partially sterilized sand, loamy garden soil and compost, with and without the addition of various concentrations of glucose, peptone, or biomalt. The method used was to attach to a glass slide 6-8 agar discs containing the fungal hyphae, to place the slide horizontally in a petri dish half filled with the soil, and to cover it loosely with the remaining soil. The diameters of the resulting colonies were strikingly uniform

for any one set of conditions, and hyphal morphology was found to depend to a quite unanticipated degree on the soil and the added nutritive material.

[467] 631.427.2 : 631.466.1
DAWSON, V. T. ; DAWSON, R. C. **Further observations on the use of rose bengal for the enumeration of soil fungi.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (268-269).

An aqueous solution of 1:150 of rose bengal was added to a glucose nitrate-soil extract agar in the proportion of 1 ml. of the stain to 100 ml. of medium. The growth of pure cultures of various soil fungi was tested in this medium. Both freshly isolated cultures and old stock cultures were tested. The rose bengal reduces colony size and checks spreading and thus increases the accuracy of plate counts. Counts were made from sporulating cultures using dilutions of 1/1000, 1/10,000 and 1/100,000. On the whole, counts made with rose bengal were higher than those made without, although the results were not statistically significant.—L.M.C.

[468] 631.427.4 : 631.416.871.1
LÖHNIS, M. P. **The action of manganese on the development of *Aspergillus niger*.** *Antonie van Leeuwenhoek* 10, 1944/1945. (100-122). *Biol. Abs.* 21 (1779). [Agric. U., Wageningen]

In a study of the suitability of *A. niger* for the estimation of Mn in soil, it was shown that Mn was essential for sporangia formation only in acid media and that the intake of Mn on various media showed but slight differences. It is unlikely, therefore, that an *Aspergillus* standard would be suitable for soil testing.

631.43 SOIL PHYSICS

(See also Abs. Nos. 458, 543, 549, 724)

[469] 631.43 : 631.874
McVICKAR, M. H. ; BATTEN, E. T. ; SHULKUM, E. ET AL. **The effect of cover crops on certain physical and chemical properties of Onslow Fine Sandy Loam.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (47-49). [Va. Agric. Expt. Sta., Blacksburg]

After four years of green manuring with five treatments (fallow, ryegrass, crimson

clover, vetch and Austrian winter peas) it was found that (1) there was no significant change in total soil nitrogen; (2) organic-matter content was not significantly increased; (3) water-holding capacity of the soil was not affected; (4) percolation of water in the field was slightly different for the four crops, being most rapid for the deep-rooted peas and least for the shallow-rooted clover.—H.L.P.

[470] 631.431:547.821.3
CLARE, K. E. **Effect of cetyl pyridinium bromide on the water absorption and swelling of soil.** *Nature* 160, 1947 (828-829). [Road. Res. Lab., Harmondsworth]

The addition of the salt to a clay soil does not destroy its permeability, but inhibits adsorption of water by the clay particle, and hence its swelling. Cetyl-pyridinium ions may be adsorbed on the surface of the clay particles, reducing their tendency to hydrate.

[471] 631.432:634.975
PRUITT, A. A. **A study of the effects of soils, water table and drainage on the height growth of slash and loblolly pine plantations in the Hofmann Forest.** *Thesis. Univ. N.C. Abs. in J. Forestry* 45, 1947 (836).

The effects of drainage were studied on the poorly drained "pocosin-margin" timberland which, although potentially very productive, supports only poor stands of pond pine. The depth of the water table, which decreased with increasing distance from the drainage canal, was affected to 1000 feet from the drainage source, but height growth was affected for only 500-600 feet. The chemical composition of the soil was unaffected by the relationship of the water table to the ground surface, while physical properties improved with drainage.

[472] 631.432.2:536.7
GARDNER, W.; CHATELAIN, J. **Thermodynamic potential and soil moisture.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (100-102). [Utah Agric. Coll., Logan]

Theoretical difficulties in the application of thermodynamics to the soil-moisture equilibrium are discussed, but not resolved.—H.L.P.

[473] 631.432.3:551.48
MORSE, H. H. **Soil profile characteristics and stream behaviour.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (442).

Discharge data are given for four topographically comparable catchments differing in the nature of their soils. According to the nature of the soils the average annual discharge increased in the order half-bog soils, gravelly soils, planosols, lithosols. The maximum discharge rate from the four catchments was approximately the same, indicating that under very heavy rains there may be little difference in the flow. The main soil factors affecting discharge seemed to be permeability and the formation of cracks in dry periods.

[474] 631.432.3:631.472
SMITH, R. M.; BROWNING, D. R. **Some suggested laboratory standards of sub-soil permeability.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (21-26). [W. Virginia Agric. Expt. Sta., Morgantown]

Main requirements are:—samples must not have the natural structure disturbed; effects of trapped air must be eliminated; samples with obvious channels, cracks or leaks must not be used; measurements should not be long delayed after saturating the sample.

A sufficiently wide range of permeability rates exists among soils for six groups to be distinguished, ranging from rates of more than 10 inches to less than 10^{-3} inch per hour. Reasonably good agreement is found between laboratory groups and field estimates of relative permeabilities.—H.L.P.

[475] 631.432.4:581.032.3
ROBERTSON, L. S.; KOHNKE, H. **The pF at the wilting point of several Indiana soils.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (50-52). [Purdue Univ., Lafayette]

Twenty samples from different depths of seven soils varying widely in texture and organic-matter content gave values between 4.00 and 4.28, using soybeans as test plants. The pF of 4.1 represents most nearly the wilting point of all soils used.—H.L.P.

[476] 631.432.4:631.432.2
KOHNE, H. **The practical use of the energy concept of soil moisture.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (64-66).

Urging the popular use of the pF concept, a detailed table is given showing the inter-relations of the energy units employed in research, the practical methods of measuring pF, and the corresponding soil-moisture constants and some of the field properties they control. It is proposed that soil-moisture constants should be standardized on a pF scale in a form that would be of help in practical problems, without hampering research on the energetics of soil moisture.—H.L.P.

[477] 631.433.1 : 631.58
KUMMER, F. A. ; PARKS, R. Q. **A report of the progress on soil porosity measurements at the Tennessee Valley Substation, Alabama.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (74-76).

Soil-porosity relationships were followed for one year under different cropping systems. Increases in pore space resulted only from tillage operations. The increases were temporary, and no increases in structural stability were observed.

[478] 631.434
SCHUYLENBORGH, J. VAN. **A study on soil structure.** *Thesis, Wageningen*, 1947, pp. 110. [E.du.]

Since soil structure refers to a dynamic rather than a static phenomenon three forms of structure are distinguished :

(1) *floc structure*—floc formation as a result of coagulation of soil suspensions, (2) *micro structure*—the formation of soil aggregates from flocs of primary particles, and (3) *macro structure*—the arrangement of soil aggregates in respect to each other.

The problems connected with soil structure are physicochemical or biophysical. An extensive and critical review of older work is brought together. The experiments are based on the selection of the major factors involved in the various forms of structures. Thus the effect of various cations and humus in floc structure was studied by measuring the sedimentation volumes of clay-mineral suspensions. The effect of fertilizer practice and different types of cultivation on soil structure is shown by analyses of a series of soils. The inter-relationship between structure and water and air conditions of soils was followed by capillary-tension measurements.—S.H.

[479] 631.434 : 535.82
SELIAKOV, S. N. **[Microscopic structure of aggregates of soils of the Baraba steppe.]** *Pochvovedenie* 1947 (158-166). [R.e.]

The structure of sections of aggregates from different genetic horizons of solonchetses, chernozems and solods were observed under the microscope. The aggregates of each soil type displayed specific characteristics. The solonchetses aggregates were characterized by a more or less evenly distributed dark colour derived from organic and mineral colloids. The chernozem aggregates were characterized by the accumulation of dark material in minute spherical masses indicative of the flocculation of colloids. The solod aggregates were similar to the solonchetses aggregates except that the micro-aggregates of the B horizon resembled those of the A horizon of a chernozem. The mineral composition of aggregates from different soils varied mainly according to the nature of the soil-forming rock. There was a general similarity in the structure of aggregates from horizons of one type, but belonging to different soils.

[480] 631.434 : 631.417 : 631.43
FREE, G. R. ; LAMB, J., JR. ; CARLETON, E. A. **Compactibility of certain soils as related to organic matter and erosion.** *J. Amer. Soc. Agron.* 39, 1947 (1068-1076). [S.C.S., U.S.D.A. and Cornell Univ. Agric. Expt. Sta.]

Compactibility and permeability of soils under mechanically applied forces are associated with organic matter. Comparisons are made of compaction-moisture curves for soils differing in the amount of organic matter they contain. Soils containing the most organic matter were least compacted by a given compactive effort at a given soil-moisture content. Maximum compaction occurred when moisture content was high. For 3 out of the 4 soil series studied, the differences in organic matter were directly related to the extent of past erosion.

[481] 631.434 : 631.432.4
FENG, C. L. ; BROWNING, G. M. **Aggregate stability in relation to pore size distribution.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (67-73).

Samples of the 2-1-mm. fraction of air-dry soils were wetted to saturation and then

allowed to drain under suction, the suction (p) being increased in steps (dp) of about 2-3 cm. of water at a time up to 50 cm. At each step the volume of water withdrawn (dv) was measured and a graph of dv/dp against p plotted. Peaks were obtained in the curves characteristic of the aggregate size, and attention is concentrated on the value of dv/dp at the peak, previously symbolized by Childs as h . After a cycle of wetting and drying the position of the peak and its height are changed. Whereas Childs suggested that h/h_0 could be used as a measure of aggregate stability (i.e. the ratio of peak heights after and before the cycle, irrespective of position), the authors suggest that h_0/p_0 is a better "stability factor" which can be used without the necessity of wetting and drying the soil to obtain values of h_1 and p_1 .—H.L.P.

[482] 63I.434 : 63I.46I
KROTH, E. M.; PAGE, J. B. **Aggregate formation in soils with special reference to cementing substances.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (27-34). [Ohio State Univ., Columbus]

Electron-microscope studies of natural and synthetic micro-aggregates showed that aggregating agents are uniformly distributed throughout the mass and that polar organic substances act as binding agents through physico-chemical bonds. No evidence was obtained that organic matter exists as a capsule around soil particles.

Study of soil stabilization by decomposition products of various types of organic matter showed that if the organic matter was fresh the decomposition products had a binding effect on dispersed Miami silt loam. Composted materials were ineffective, because they did not serve as sources of energy for micro-organisms whose activities could have caused aggregation.

Natural aggregates ranging from 3.36 to 3.96 mm. were analysed chemically and physically. Samples were refluxed with alcohol, acetone and ether to remove fats, waxes and resins, and submitted to an abrasion test. Aggregates from poorly drained Brookston soil lost stability by the extraction process; those from well drained Miami soil suffered no appreciable change in stability. The abraded material was col-

lected in stages until a core of about 2 mm. diameter was left. Analysis of the outer shells and the cores showed no evidence of organic-matter concentration; a probable reduction in nitrogen content in the aggregate centre was indicated.

It is concluded that the major factors in aggregate formation are the polar organic substances formed from freshly decomposing organic matter. Composts do not appear to improve soil aggregation.—H.L.P.

[483] 63I.434 : 63I.46I
MCCALLA, T. M. **Influence of some microbial groups on stabilizing soil structure against falling water drops.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (260-263). [Neb. Agric. Expt. Sta., Lincoln]

Sterile lumps of loess of a low stability were treated with various organisms contained in an organic nutrient solution (1% proteose peptone, 3% glucose, etc.). After incubation the stability of the lumps was tested by the water-drop method. The organisms, arranged in order of descending effectiveness, were: fungi; actinomycetes; certain bacteria, e.g. azotobacter; certain Rhizobia; gum-formers; yeasts; other bacteria. The addition of less effective organisms or of a soil inoculum to the more effective organisms resulted in a decrease in their stabilizing power. The organic nutrient added had considerable effect on the stabilization of soil structure; sugars were the most effective of the materials tested; crop residues, cellulose, tannic acid and tryptone were also effective.—L.M.C.

[484] 63I.434 : 63I.51
CLARKE, G. B.; MARSHALL, T. J. **The influence of cultivation on soil structure and its assessment in soils of variable mechanical composition.** *Aust. J. Coun. Sci. Indust. Res.* 20, 1947 (162-175).

The change in water-stable aggregation, resulting from increasing periods of cultivation of grassland, was measured for two types of soil, using a wet-sieving and a suspension procedure. The results were on the whole more erratic by the wet-sieving method, and a larger number of samples were required with this method than with the suspension procedure. There was a marked decline in aggregation and in N content of the surface soils with increasing

periods of cultivation. The decline in N content and in aggregation of the surface soil was greatest in the first few years of cultivation. Cultivation had much less effect on aggregation and the N content of the sub-surface soil than of the surface soil.

[485] 631.434 : 631.58
SAUERLANDT, W. Schaffung und Erhaltung der Bodengare. [Creation and maintenance of optimum tilth.] *Imbshäuser Hefte* No. 1, 1947 (23-39). [G.]

Görbing's "spade test" is based on inspection of the depth of successive layers of the tilled fraction of the soil, and is claimed to afford a rapid and reliable grading of the tilth of a soil and of the mean tilth of a farm. The "tilth value," G, of a soil =

$$\frac{100 V_0}{T \log (V_2 + V_3^2)}$$
 in which T = the tilled depth, and V_0 , V_2 and V_3 respectively are the depths of (1) the friable, crumb layer, (2) the more compacted or clodded layer fracturing by sharp edges and (3) any yet more strongly compacted layer, all expressed as percentages of T. V_1 , the depth of the slightly compacted layer which breaks into crumbs, does not affect the result, and is left out of the formula. G lies between 0 and the optimum of 100.

Experiments in rather heavy soils showed that (1) P fertilizing greatly encouraged crumb formation, raising the tilth value and also P availability; (2) variations in stocking density considerably but slowly influenced the mean tilth value for farms; (3) the most effective maintenance of optimum tilth is by the inclusion within the rotation of main or catch crops which encourage crumb formation, e.g., beans, serradella, oats with peas or vetches, sunflower or rape, and at least $\frac{1}{3}$ of the farm arable land should be under such crops.

[486] 631.434 : 631.58
SCHULZ, G. Grundfragen der Bodengare. [Fundamental questions of soil tilth.] *Imbshäuser Hefte* No. 1, 1947 (40-44). [G.]

Stresses the need for correct rotation and liming, and especially for correct ploughing and cultivation in the interests of optimum soil tilth. Tilth in western European conditions is naturally limited to about 22 cm., which is the maximum depth which should be turned. Ploughs should have

attachments to enable (if required) a simultaneous loosening, not turning, of the soil for 20 cm. below this depth, and furrows should not be broad. For catch-cropping, a 2-layer plough should be used, turning 6-10 cm. and loosening a further 15 cm.

[487] 631.434 : 631.58
OLMSTEAD, L. B. The effect of long-time cropping systems and tillage practices upon soil aggregation at Hays, Kansas. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (89-92).

Based on the present aggregation of virgin buffalo-grass pasture, all plots showed a loss of about 80% of their initial aggregation in the top 5 inches since they were broken up in 1902. The lower half of the top foot, and the middle of the second foot of soil showed only slightly lower aggregation than virgin pasture. There were no water-stable aggregates at a depth of 30 inches. After five years under buffalo grass the water-stable aggregation of tilled plots was doubled.—H.L.P.

[488] 631.434 : 631.58
PAGE, J. B.; WILLARD, C. J. Cropping systems and soil properties. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (81-88). [Ohio State Univ., Columbus]

Four-, three-, and two-course rotations were compared with continuous growing of corn on clay soils. Big changes in physical properties resulted:—plots on the long rotations, especially with two years of alfalfa-grass mixture, were well aggregated, drained readily, and easy to plough and to reduce to a seedbed; under continuous corn, or where legumes and grasses were omitted, aggregation was poor, soils puddled easily, water accumulated on the surface, and the soils were muddy and sticky. Good crops were obtained where the physical conditions were good; in particular, corn yields were closely related to the degree of aggregation found at the end of the corn season. Fertilizers gave little response, and were incapable of increasing yields reduced because of physical deficiencies.—H.L.P.

[489] 631.434 : 631.86/7 : 631.67
RAY, S. H.; SHANKS, J. B. The aggregation and aeration of some greenhouse mixtures for roses and carnations.

Proc. Amer. Soc. Hort. Sci. 49, 1947 (420-426). [Ohio Agric. Expt. Sta.]

This investigation was concerned with the effects of additions of organic and inert materials, methods of water application, mulching materials and mechanical modification on aggregation, air space and soil-air composition. The results of each treatment are described.

[490] 63I.434 : 63I.874
LUTZ, J. F.; NELSON, W. L.; BRADY, N. C. ET AL. **Effects of cover crops on pore-size distribution in a Coastal Plain soil.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (43-46). [N.C. Agric. Expt. Sta., Raleigh]

Measurements were made on soil samples of the percentage of pores drained at 10 and 60 cm. of water suction. In some cases, soils on which a winter cover crop had been grown showed an increase in drainable water over controls without a crop. Some of the differences between crops appeared to be due to variable intervals between sampling and the last previous cultivation. There is no indication of any cultivation on the uncropped controls.—H.L.P.

[491] 63I.434 : 633.2
MCHENRY, J. R.; NEWELL, L. C. **Influence of some perennial grasses on the organic matter content and structure of an Eastern Nebraska fine-textured soil.** *J. Amer. Soc. Agron.* 39, 1947 (981-994).

There was a highly significant difference in total N and readily oxidizable organic matter of the soil under various grass covers for the 0- to 6-inch depth, and in the percentage of soil aggregates greater than 0.25 mm. diameter for the 1- to 3-inch depth. The differences between grass covers were not significant for the readily oxidizable material at 6-12 inches. The difference in the percentage of soil aggregates greater than 0.25 mm. diameter was significant under different grass covers at 5-7 inches and highly significant at 11-13 inches. Blue grama, brome grass and bluegrass maintained the highest organic content and imparted the greatest stability to the soil aggregates.

The difference in the ability of grasses to stabilize soil aggregates appears to be a function of the differential root development of the individual perennial grasses. Other

grasses that maintained the highest organic-matter content were buffalo grass and orchard grass.

[492] 63I.435 : 634.9-1.44
HOLTBY, B. E. **Soil texture as a site indicator in the ponderosa pine stands of southeastern Washington.** *J. Forestry* 45, 1947 (824-825). [U.S. For. Serv.]

40 samples of soil were collected at depths of 6 inches on each of 3 sites in a level to gently rolling area of ponderosa pine. In this region the soil texture indicated fairly reliably the site quality, which was determined on a basis of age and tree height.

[493] 63I.436 : 63I.411.4
RIGG, G. B. **Soil and air temperatures in a sphagnum bog of the Pacific coast of North America.** *Amer. J. Bot.* 34, 1947 (462-469). [Univ. Washington, Seattle]

Soil- and air-thermograph records for a sphagnum bog at 300 feet showed that day-to-night changes in air temperature were larger than those in corresponding soil temperature. During the growing season soil temperatures ranged from 46°F. to 68°F. The minimum air temperatures were low compared with those of a sphagnum area in a cranberry marsh with a continental climate and, with large sudden changes in air temperatures and high air temperatures simultaneous with low soil temperatures, largely determine which species can grow there.

63I.44 SOIL TYPES

(See also Abs. No. 717)

[494] 63I.445.11
CAILLEUX, A.; HUPÉ, P. **Présence des sols polygonaux et striés dans les Pyrénées françaises.** [The presence of polygonal and striated soils in the French Pyrenees.] *C.R.* 225, 1947 (1353-1355). [F.]

These types, common in Arctic regions, occur in the easily accessible Orédon area (Hautes-Pyrénées) at altitudes of 2700-3000 m. The polygonal structures are 12-60 cm. in diameter, with the finer earth towards the centre, and with the circumference composed of stones of up to 20 cm. in diameter. As the gradient increases from 0 to 7°, the formations increase in length

parallel to the slope, becoming transformed on slopes up to about 27° into striated soils composed of alternate bands of fine soil and stones, parallel to the slope, and 10-30 cm. wide.

[495] 631.445.2
LYFORD, W. H. **The morphology of the brown podzolic soils of New England.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (486-492).

The soils are characterized by a thin, dark greyish-brown A₁ horizon 2-3 inches thick, and a B horizon extending to a depth of about 30 inches. Downward leaching of clay is too slight to be noticed. The yellowish-brown B horizon becomes lighter in colour with depth. Both A and B horizons have a fine crumb structure and a fairly firm consistence. The reaction is strongly acid throughout, except where the parent rock is calcareous, when the lower B horizon is weakly acid to neutral.

[496] 631.445.2 : 549
METALSKI, R. P.; TURK, L. M. **Heavy minerals in some podzol soil profiles in Michigan.** *Soil Sci.* 64, 1947 (469-487). [Mich. Agric. Expt. Sta.]

Studies of two groups of podzolic soils included mechanical analyses, determination of reaction, free alumina, iron oxide and colloidal silica and heavy-mineral investigations. In all soils the total amount of heavy minerals was greatest in the C and lowest in the B horizons, and hornblende, garnet, epidote, zircon, tourmaline, tremolite, muscovite and the opaque minerals were identified. Soils supporting hardwoods contained more Ca and Mg heavy minerals in all horizons than those under a pine cover. The results of Neubauer tests were compared with those obtained from analysis of the heavy minerals, and suggested that there was no nutrient delivery from the C-horizon minerals to the plant. Growth on the B horizons showed a decided increase over the quartz-sand control, especially on those which had supported a hardwood cover and, since the particles from these horizons were highest in coatings of organic matter, it was suggested that organic matter is effective in the weathering of heavy minerals. The brown B horizon of some podzols was

shown to be the result of a vigorous decomposition of a relatively high original content of opaque and ferromagnesian minerals.

[497] 631.445.5 : 529.2
TAMÉS ALARCÓN, C. **La influencia del tiempo como factor formador del suelo. [The influence of time in soil formation.]** *Bol. Inst. Investig. Agron. Madrid* No. 15, 1946 (1-47). [Sp.e.g.]

A study of 3 commonly occurring Spanish soils supported the view that when classifying soils formed under arid and semi-arid climatic conditions, account should be taken of the age of the soil as a genetic factor. The soils concerned were (1) an immature grey steppe soil, (2) a grey steppe soil forming above an old solonets and (3) a grey steppe soil with a reddish tint due to the persistence of the colour of the parent red loam; these might respectively have been wrongly classified as a brown forest soil, a solonets soil and terra rossa.

[498] 631.445.54 : 549
BROWN, A. L.; CALDWELL, A. C. **Clay mineral content of the colloidal material extracted from a solodi soil profile.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (213-215).

Chemical analysis of the colloidal-clay fraction of several horizons of a solod profile, together with cation-exchange data and a comparison of the average analysis of the profile with that of 12 bentonites indicated that montmorillonite was the main mineral present in all horizons, with some hydrous mica. The acid reaction and low concentration of bases suggest a predominance of kaolinite, and the presence of montmorillonite in all horizons appears to indicate its persistence in the soil regardless of the soil-forming processes. X-ray analysis indicated some illite in the A horizons, and possibly kaolinite in the parent material. Quartz was found in all horizons.

[499] 631.445.7 : 631.416
MAREL, H. W. VAN DER. **Tropical soils in relation to plant nutrition.** *Soil Sci.* 64, 1947 (445-451). [Agric. Univ. Wageningen]

The rapid weathering of tropical soils liberates readily available plant nutrients

which cannot be determined by methods of soil analysis used in temperate zones. For example, in slightly weathered rhyolitic soils of Sumatra only 280 to 700 kg./ha. of K_2O in a 30-cm. depth of soil and traces of Mg are found by percolation with 0.5 n. NH_4Cl , yet crops do not respond to K fertilizers or show deficiency symptoms. 4,500 to 6,000 kg./ha. of K_2O and 1,500 to 3,000 kg./ha. of MgO can be extracted with 25% HCl which dissolves much of the biotite present. In the more weathered soils, little biotite remains, and crops may suffer from K and Mg deficiency. Similarly the andesitic ash and clay soils of Java support the growth of rubber, coffee, sugar cane and sisal although containing only a few m.e. of exchangeable Ca, Mg and K, these elements being apparently supplied by the readily weathered minerals present. Usual methods of determining available P also give unreliable results owing to the large amounts of Fe and Al liberated by active weathering. In slightly weathered ash soils, the P supplied by minerals such as basic volcanic glass and apatite is sufficient to give optimal harvests. The rhyolitic soils of Sumatra have a low P content, but enough P is available in the soil organic matter to prevent the occurrence of P-deficiency symptoms in rubber, oil palm, tea and sisal. This P disappears on cultivation.

[500] 631.445.7: 631.417
CHAVERRI, G. La materia organica y el nitrogeno en los suelos tropicales. [Organic matter and nitrogen in tropical soils.] *An. Col. Ing. Agron.* 2, 1946 (36-40). [Sp.]

Tropical high temperatures and bright light favour factors such as bacterial action, whose optimum temperature is 30-35°C., and photochemical oxidation in the presence of Al_2O_3 (both of which destroy soil organic matter), rather than vegetative growth which causes accumulation of organic matter at optimum temperatures of 20-25°. Although plant growth may reach 200 tons/ha. a year in humid forests, a humus-containing layer 20 cm. deep is rare. Emphasis is put on the need to mulch cocoa, coffee and coconut plantations and for green manure, composts and manure to balance the rapid losses of organic matter and hence of N where annual crops are grown.

[501] 631.445.7: 631.417
ROCCHETTI, G. La materia organica nei paesi tropicali. [Soil organic matter in tropical climates.] *Riv. Agric. Subtrop.* 41, 1947 (234-247). [I.]

Review of the observations and hypotheses of Milne, Mohr, Jenny and others bearing on the relations between temperature, altitude and location to the content of soil organic matter. The colour of tropical soils is no index to organic-matter content; soils of primary tropical forest often derive a violet colour from their complex of organic matter and minerals. Following Milne and Vageler a distinction is made between "clay" in the mechanical sense of particles < 0.002 mm. and physico-chemical clay. The former "clay" may be composed of heterogeneous material, and to avoid ambiguity Italian workers have been accustomed to call it "argilliform matter." The distinction between the two assumes importance for tropical soils, in which the finest inorganic particles have a small proportion of true clay (alumino-silicates) and largely consist of material with a low SiO_2/R_2O_3 ratio and a small exchange capacity. In temperate soils the base-exchange capacity is due to a complex of organic matter and true clay, but in tropical soils it is referable mainly to the organic matter. Further distinctions may be made, e.g., between arid and humid tropical soils.—R.N.

[502] 631.445.7: 631.48
STEPHENS, C. G. Pedogenesis following the dissection of lateritic regions in Southern Australia. *Aust. Coun. Sci. Indust. Res. Bull.* 206, 1946, pp. 21.

The genesis and relationships of soils found in the various lateritic regions of Southern Australia are discussed. Descriptions are given of a typical, normal untruncated lateritic profile, of materials exposed by truncation and dissection and of new sedimentary soils developed on the exposed materials. The different soils are related to the various horizons of the original lateritic soils and the parent rock, and parallel relationships are shown to exist between the soils and the original lateritic soil profile for all regions. A diagram representing a lateritic profile in all stages of truncation provides a key to the interpretation of soil and topographical pattern in the lateritic regions of Southern Australia.

631.459 SOIL EROSION

(See also Abs. No. 516)

[503] 631.459 : 551.3.051
GOTTSCALK, L. C. **Effects of soil erosion on navigation in upper Chesapeake Bay.** *Geog. Rev.* 35, 1945 (219-238). *Biol. Abs.* 21 (1765).

Between 1846 and 1938, 85 million cu. yards of sediment were deposited at the head of Chesapeake Bay owing to improper land use and soil-wasting methods in the production of tobacco, and unless soil-conservation methods are applied the heavy costs of harbour maintenance must be expected to increase.

[504] 631.459 : 551.48
KRIMGOLD, D. B. **Managing surface run-off.** *U.S.D.A. Yrbk.* 1943-1947, 1947 (537-540).

Rate of run-off from a small area changes rapidly and irregularly. It can be calculated from the depth of water flowing over a weir or through a flume, using a water-level-recorder that gives a continuous record of the depth of flow for intervals of a few minutes. Structures for controlling run-off are usually designed to cope with the largest flow to be expected in 10, 15, 25 or 50 years, according to the cost the farmer is ready to incur. Run-off water may be stored in ponds and utilized for farm purposes.

[505] 631.459 : 551.577
ELLISON, W. D. **Exploring soil erosion.** *J. Soil and Water Conserv.* 2, 1947 (194-200, 204).

Simple experiments are described which may be used to demonstrate four "fundamental truths" concerning erosion by rain-drop, namely, (1) erosion on soil surfaces is accelerated by the splash of falling raindrops; (2) erosion on the soil surface is accelerated by increasing sizes and velocities of the drops; (3) some soils are more detachable by raindrops than others; (4) the splash-erosion process is sensitive to changes in cover.

[506] 631.459 : 581.5
KILLIAN, C.; MOUSSU, H. **Dégradation de la végétation et des sols dans le massif de la Bouzarea, ses caractères phytosociologiques, pédologiques et microbiologiques.** [Degrad-

ation of vegetation and soils in the Bouzarea massif, its phytosociological, pedological and microbiological characters.] *C.R.* 226, 1948 (118-120). [F.]

The destruction of tree and shrub vegetation and the parallel deterioration of the soil has been studied on siliceous soils near Algiers. A secondary climax is represented by holm oaks and true scrub. In the course of degradation these disappear and are eventually replaced by the pyrophytes *Quercus coccifera* and *Cistus monspeliensis*. Eventually a cistetum provides a 90% degree of cover. *Cistus* is succeeded by *Inula viscosa* in previously cultivated parts with up to 30% of fine clay and by grass swards in silty hollows. This meadow flora is absent from the rocky 20-30% slopes, but appears mixed with certain scrub elements on the gentler slopes. Swards with only a 10-20% degree of cover occur on the sloping soils which are strongly fissured after clearing. *Ormenis praecox*, *Oxalis cernua* and eventually *Rumex bucephalophorus* are the dominant species. This degradation of vegetation is accompanied by soil degradation which is represented by an increase in pebbles and large soil elements and by a decrease of moisture and C contents. Microbiological characters, however, especially the cellulose-decomposing capacity, provide a more sensitive criterion of soil degradation than physical and chemical characters. This capacity is nil on gneiss sand of low moisture content and reaches its maximum in oak and *Cistus* litter. It is possible to stimulate cellulose decomposition, especially in poor soils, by increasing the water content, incorporating 10% humus or adding P and N.

[507] 631.459 : 631.582
UHLAND, R. E. **Rotations in conservation.** *U.S.D.A. Yrbk.* 1943-1947, 1947 (527-536).

Data are cited to show that crop rotations control run-off and erosion, improve soil aggregation, increase soil organic matter and yields, and improve eroded land.

[508] 631.459 : 631.61
KEW, A. **Springs made to flow in Vlekpoort Valley.** *Farm. Week. S. Africa* 74, Dec. 10, 1947 (52-55).

An account of a very successful soil-conservation scheme made up of "thousands of small works" integrated into a whole.

The writer maintains that only the resident landowner himself can grasp all the necessary details of a comprehensive soil-conservation plan, consequently not too much reliance should be placed on government assistance and subsidies.

[509] 631.459 : 631.61
HARROLD, L. L. **Land-use practices on run-off and erosion from agricultural watersheds.** *Agric. Engng.* 28, 1947 (563-566). [S.C.S. Res. Sta., Coshocton, Ohio]

By plotting run-off from an area where conservation practices are used against run-off from an otherwise similar area without conservation, the cumulative effects (if any) of the conservation practices can be demonstrated. In an area in which the sealing of the surface soil by rainwater was a major hazard, it was found that use of lime and fertilizers alone or the introduction of lucerne into a maize-wheat rotation had little effect on water conservation, but the introduction of two years of meadow was effective, by preventing surface sealing and allowing large quantities of water to be stored in the soil. Mulch culture was immediately effective. Contour cultivation was ineffective with storms of over one inch of rain, but saved some water with lesser storms. Strip cropping retarded loss of soil, but did not save much water.

[510] 631.459 : 633.2
RAMSER, C. E. **Grass in farm waterways.** *U.S.D.A. Yrbk.* 1943-1947, 1947 (541-546).

Whether a plant lining is sufficient to protect a waterway from erosion or whether it should be supplemented by check dams or other mechanical protection depends on the gradient and size of the waterway, character of the soil and other local conditions. Different grasses and legumes are discussed in relation to their value as a protective lining for waterways in relation to different velocities of flow.

[511] 631.459.005
WILTSHIRE, G. R. **Run-off plots and standard run-off and soil loss measuring equipment used by the New South Wales Soil Conservation Service.** *J. Soil Conserv. Serv. N.S.W.* 3, 1947 (171-178).

Details are given of equipment designed by the U.S. Soil Conservation Service that has been installed at the lower end of each

plot which is 100-200 feet long and about 8 feet wide with buffer areas of 4 feet wide on either side.

631.46 SOIL MICROBIOLOGY

(See also Abs. Nos. 466, 482, 483, 570, 602)

[512] 631.46
NORMAN, A. G. **Recent advances in soil microbiology.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (9-15).

The subjects reviewed are the soil population, soil structure and aggregation, nitrogen transformations and nitrogen fixation.

[513] 631.461 : 542.943
PILLAI, S. C.; WADHWANI, T. K.; GUR-BAXANI, M. I. ET AL. **Relative efficiency of bacteria and protozoa in the flocculation and oxidation of organic matter suspended in water.** *Curr. Sci.* 16, 1947 (340-341). [Indian Inst. Sci., Bangalore]

81 bacterial strains isolated from water, soils, compost heaps, raw sewage and sludges and faeces of animals were introduced singly and with protozoa into sterile, aerated suspensions of organic matter prepared from soil, sewage and compost. The bacteria showed poor oxidizing and flocculating activity in comparison with the protozoa and activated sludge. Nitrifying bacteria were present in all the sources examined, but maximum nitrification was only produced in the presence of the protozoa.

[514] 631.461 : 546.22
TCHAN, Y. T. **[Influence of sodium thiosulphate on some groups of useful soil micro-organisms.]** *Ann. Inst. Pasteur* 73, 1947 (242-258). B.A.B.III. 1947 (133).

In soil, S is converted into $\text{Na}_2\text{S}_2\text{O}_3$ which depresses the development of *Azotobacter* and *Nitrosocystis* and poisons motile, cellulolytic organisms although non-motile species especially *Cytophaga hutchinsoni* and *C. lutea* are resistant. $\text{S}_2\text{O}_3^{2-}$ is converted to SO_4^{2-} by autotrophic $\text{S}_2\text{O}_3^{2-}$ -oxidizing organisms.

[515] 631.461 : 576.809.7
WAKSMAN, S. A. **Soil organisms and disease.** *U.S.D.A. Yrbk.* 1943-1947, 1947 (511-517).

The freedom of the soil from most of the pathogenic organisms attacking animals and

humans is due to the production of antibiotics by soil organisms. Of 100 antibiotics that have been isolated only 3—tyrothricin produced by *Bacillus brevis*, penicillin produced by *Penicillium notatum-chrysogenum* and streptomycin produced by *Streptomyces griseus*—have at present any therapeutic importance.

[516] 631.461 : 631.452
GARBOSKY, A. J. Estudio edafo-microbiológico de 7 suelos. [A pedological and microbiological study of 7 soils.] *Rev. Fac. Agron. La Plata* 26, 1946 (61-69). [Sp.]

7 soils of known cultural history and producing capacity were analysed physically, chemically and with reference to their power of N fixation, nitrification and cellulose decomposition. There was no striking correlation between microbiological activity and soil quality; a soil of moderate productivity showed high power of nitrification, etc., due entirely to its high alkalinity (pH 9), while the most fertile soil showed much less activity.

[517] 631.461.1/3
BROADBENT, F. E.; NORMAN, A. G. Some factors affecting the availability of organic nitrogen in soil—a preliminary report. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (264-267). [Iowa Agric. Expt. Sta., Ames]

N in soil is immobilized by micro-organisms as the result of the presence of an excess of available energy-material. The course of the N transformation was followed by using N^{15} , and the available N was estimated in a crop of Sudan grass. A soil low in N and organic matter was used; 1-kg. samples were mixed with 25 gm. of oat straw with a N content of 0.54%. Calcium-nitrate solutions containing 6.53% N^{15} were added in varying amounts. After a 2-weeks incubation-period soil nitrate was determined and Sudan grass was sown in pots in a greenhouse. In half the pots the whole crop was harvested at 58 days and in the other pots successive cuttings were made. All samples were analysed for N. Small amounts of N were liberated in two months from a pot in which the total N was only 0.94% of the weight of straw, and appreciable quantities were liberated from a mixture containing only 1.34% N. The results indicated that organic N is fairly available to micro-organisms.

Decomposition of soil organic matter was greatly accelerated by additions of Sudan grass. The rate of decomposition appeared to be a function of the amount of available energy material.

[518] 631.461.1/3 : 631.432.2
BARTHOLOMEW, W. V.; NORMAN, A. G. The threshold moisture content of active decomposition of some mature plant materials. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (270-279).

The threshold moisture content is that below which microbiological activity is inhibited. In these experiments data obtained at 25° and 37°C. were nearly the same, and were: for lucerne 20% moisture and 75-80 relative humidity; for Sudan grass 14-16% moisture and 77-82% R.H.; for oat straw and hemp bark 15-17% moisture and 77-82% R.H.; for pine needles 15-17% moisture and 80-86% R.H.; for Sudan-grass roots 10-12% moisture and 80-86% R.H.

[519] 631.461.5
KRASILNIKOV, N. A.; KORENIAKO, A. I. [The influence of non-nodule bacteria on the growth and nitrogen fixation of leguminous plants.] *Mikrobiologia* 15, 1946 (417-421). [R.e.]

In the first of two series of experiments clover was inoculated with nodule bacteria of peas, french beans and lucerne. In the second series the inoculation consisted of non-nodule bacteria, *Pseudomonas aurantiacum*, *P. fluorescens* and others. N fixation took place in clover cultures in the complete absence of nodules, but in the presence of bacteria activating this process round the roots. The amount of N fixed may be as great as after the inoculation of clover with nodule bacteria. The role of the activating bacteria appears to consist in producing biological catalysers which penetrate into the plant and stimulate the process of the fixation of N by the plant tissue.

[520] 631.461.51 : 546.77
MATUASHVILI, S. I. [The effect of boron and molybdenum on the morphology and physiology of *Azotobacter chroococcum*.] *Mikrobiologia* 16, 1947 (19-31). [R.e.]

B is not an essential nutrient, but Mo is essential to a normal life cycle of *A. chroococcum*. It intensifies the process of

atmospheric N fixation, and stimulates the development of *Azotobacter* on the roots and in the rhizosphere of tobacco. If added to *A. chroococcum* cultures Mo hampers the cycle of development.

[521] 631.461.51 : 546.77
JENSEN, H. L. The influence of molybdenum, calcium and agar on nitrogen fixation by *Azotobacter indicum*. *Abs. Proc. Linn. Soc. N.S.W.* 589, 1947.

N fixation by *Azotobacter indicum* was stimulated by small concentrations of Mo which could not be replaced by V. Ca did not seem to be necessary or even favourable, but small amounts of agar accelerated fixation. Growth with nitrate was retarded by Mo. Free N, nitrate and aspartic acid were the best sources of N; glycine and alanine were inhibitory. A hydrogenase was formed during growth in free but not in fixed N.

[522] 631.461.51 : 631.847.2
ALLISON, F. E. *Azotobacter* inoculation of crops : I. Historical. *Soil Sci.* 64, 1947 (413-429). [U.S.D.A., Beltsville, Md.]

A review mainly of Russian work during the last 20 years. When the Russian work started it was generally agreed outside Russia that *Azotobacter* inoculation had no practical value. A large number of successes has been reported from the U.S.S.R., but the reviewer maintains that conclusive evidence of the efficacy of *Azotobacter* inoculation is lacking, and believes that "a very conservative attitude" to Russian claims should be adopted.

Three main reasons for the success of their experiments have been advanced by the Russians: (1) that N is fixed by the bacteria living in the rhizosphere largely on root secretions; (2) that the added bacteria protect the plant against pathogens; (3) that the bacteria stimulate plant growth through the production of auxins, hormones, etc. It is concluded that (3) is the most plausible explanation, but there are few reliable data to support it.

[523] 631.461.52
JENSEN, H. L. Nitrogen fixation in leguminous plants. VII. The nitrogen-fixing activity of root nodule tissue in *Medicago* and *Trifolium*. *Abs. Proc. Linn. Soc. N.S.W.* 588, 1947.

The largest numbers of root nodules were found on lucerne in alkaline or neutral sand and on clover in sand of pH 4.5-5.5. The numbers had no relationship with the amount of nodule substance or with the amount of N fixed. The nodule tissue of lucerne fixed 11-103 mgm. and that of clover 13-53 mgm. of N daily per gm. of dry substance. Acid reaction reduced the efficiency of lucerne-nodule tissue at pH 5 and below, and had no apparent effect on clover-nodule tissue even at pH 4.5. Supply of combined N reduced both the amount and the N-fixing efficiency of the nodule tissue in both plants. A Mo content of more than 10 p.p.m. in lucerne nodules and of 4-8 p.p.m. in clover nodules was necessary for full N-fixing efficiency of the nodule tissue.

[524] 631.461.52 : 577.17
CARLYLE, R. E.; THORPE, J. D. Some effects of ammonium and sodium 2,4-dichlorophenoxyacetates on legumes and the *Rhizobium* bacteria. *J. Amer. Soc. Agron.* 39, 1947 (929-936). [Idaho Agric. Expt. Sta.]

Beans, peas, red clover and lucerne were much more susceptible to 2,4-D salts than the corresponding *Rhizobium* bacteria. Hence the reduction or inhibition of nodulation in the presence of low concentrations of the NH_4 and Na salts in the soil solution is due to the effect of the herbicides on the plant and not on the bacteria. The effect of the NH_4 salt was more pronounced than that of the Na salt.

[525] 631.461.52 : 631.81
APPLEMAN, M. D.; SEARS, O. H. Nodulation studies on Morrow plot soils. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (252-254). [Ill. Agric. Expt. Sta., Urbana]

The minimum numbers of nodule bacteria of five different leguminous crops were calculated in six soils of known history. The soils came from three plots, each divided into halves, one half receiving no manurial treatment, while the other received lime, dung and phosphates. Since 1876 plot 3 has grown maize continuously, plot 4 maize and oats alternately, with sweet clover in the oats on the untreated half since 1916, and plot 5 has had a rotation of maize, oats

and red clover since 1901, except on three occasions when cowpeas or soybeans were substituted for the clover. Sterilized seeds of lucerne, sweet clover, red clover, lespedeza, soybean and pea were sown in sterile sand watered with a modified Crone solution; dilutions from six soils were prepared and applied so that 0.1, 0.01, 0.001, 0.0001 and 0.000025 gm. of soil was added to different pots. After growing the legumes for 9 weeks, the minimum numbers of nodule bacteria were calculated from the highest dilution which gave rise to nodulation. More nodule bacteria occurred in the treated than in the untreated plots, and the largest numbers in plots where the appropriate host plants were grown. The presence of lespedeza and soybean nodule bacteria in plots 3 and 4 is attributed to their presence in the dung used. There is no evidence that the bacteria could have been transported by soil cultivation, wind or water.—L.M.C.

[526] 631.461.61 : 631.415.1
BODEA, C. Capacitatea de descompunere termofila a celulozei in functie de pH-ul solului. [Thermophilic decomposition of cellulose in relation to soil reaction.] *An. Fac. Agron. Cluj* 11, 1946 (16-22). [Rm.f.]

Two sets of soils were acidified by treatment with HCl, the pH varying between 7.6 and 2.5. KNO_3 and Na_2HPO_4 and also 1% cellulose were added to these soils which were then inoculated with thermophilic micro-organisms and kept for 10 to 14 days at a temperature of between 65° and 80°C. The activity of cellulose-decomposing organisms at these temperatures was greatest at pH 7.5-6. Their activity diminished with decreasing pH and was very feeble at pH 3.5-2.5.

[527] 631.461.61 : 631.416.1
BODEA, C.; MUREȘANU, P. L. Sur la décomposition de la cellulose dans le sol par rapport à la nature de l'azote. (Première note.) [Decomposition of cellulose in the soil in relation to the form of nitrogen. (First note.)] *An. Fac. Agron. Cluj* 11, 1946 (169-178). [F.rm.]

Nitrate N and ammonium N may be considered to be of equal value as sources of N for the majority of the cellulose-decomposing micro-organisms in the soil. NaNO_2 is a less suitable source of N. Cellu-

lose decomposition was much more rapid in the presence of the amino acids glycolol and leucine than in the presence of mineral N.

[528] 631.461.74 : 631.445
MISHUSTIN, E. N. [Distribution of the variants of *Bac. mycoides* in the soils of the Soviet Union.] *Mikrobiologia* 15, 1946 (428-432). [R.e.]

Data on the distribution of the different variants in soils ranging from tundras to desert soils are tabulated. Each zone has its specific variant, e.g. the smooth variant is found in the soils of the desert zone (serozems), other ecotypes being found in podzols and chernozems.

[529] 631.462 : 631.416.1 : 631.416.2
BARODY, G. Stérilisation partielle d'un sol préalablement enrichi en humus et en acide phosphorique. [Partial sterilization of a soil previously supplied with humus and phosphoric acid.] *C.R. Acad. Agric.* 33, 1947 (613-616). [F.]

Separate square-metre plots of calcareous ground (52% of chalk) each received in April 10 kg. of rabbit manure + 100 gm. of Ca phosphates. The 4 treatments applied were (1) 10 l. of water (control), (2) 10 l. of water + 100 gm. of powdered wood charcoal, (3) 10 l. of water containing 10 gm. of KMnO_4 and (4) as in (3) + 100 gm. of charcoal. After 42 and 73 days respectively, the percentages of total N in the plots were (1) 0.12 and 0.144 (2) 0.129, 0.140 (3) 0.148, 0.18 and (4) 0.144, 0.20.

Partial sterilization by 10 gm. of (1) KMnO_4 (2) salicylic acid (3) Na metabisulphite or (4) formol, resulted in 78 days in percentage gains of available P_2O_5 (in the upper 12 cm. of soil) varying from 0.008-0.026 above the unsterilized control, except with (2), which gave no gain.

The N gains were 0.028, 0.009, 0.015 and 0.009% respectively, but the quicker-acting formol had produced in 48 days a gain of 0.020%, most of which became leached by rain.

[530] 631.466.1
SCHMIDT, E. L. Mycorrhizae and their relation to forest soils. *Soil Sci.* 64, 1947 (459-468). 40 refs. [N.J. Agric. Expt. Sta.]

Observations made on mycorrhizae since 1885 are reviewed.

The beneficial as opposed to the pathogenic nature of the mycorrhizae has been largely established by the use of pure-culture techniques by Noel Bernard, who established the importance of mycorrhizae in the germination of orchids, and by Young and Hatch who demonstrated that mycorrhizal pine seedlings absorbed 86% more N, 75% more K and 234% more P than non-mycorrhizal plants. The response to inoculation with mycorrhizae of tree seedlings which had previously failed suggests that certain soils may lack the appropriate fungi. These seem to be concentrated in humus-rich soils, especially in the F layer of the raw-humus types. Extensive experimental work on pines confirmed Stahl's theory that the frequency of mycorrhizal occurrence is inversely proportional to soil fertility. Soil factors which may relate to the failure of mycorrhizae include poor aeration, extremes of soil temperature and moisture, lack of light, high available N and the presence of toxic substances which originate from soil microbes or leaf litter.

Various theories of the symbiotic mechanism have been advanced. It has been suggested that the mycorrhizae make available the N of the humus, fix atmospheric N, can absorb nutrient elements when these are limited more efficiently than non-mycorrhizal roots, affect the carbohydrate nutrition of the tree and derive growth-promoting substances from the tree.

[531] 631.466.1 : 581.144.2
KIVENHEIMO, V. J. Untersuchungen über die Wurzelsysteme der Samenpflanzen in der Bodenvegetation der Wälder Finnlands. [Investigations concerning the root systems of phanerogams of the ground flora of Finnish forests.] *An. Bot. Vanamo* 22, No. 2, 1947, pp. 180. [G.fi.]

A detailed analysis and comparative discussion of the root morphology of 59 angiosperm species. Mycorrhiza formation was studied, and of 63 species the roots of 57 were mycorrhizal. Hyphal formation was greater in the more acid soils, appeared to increase in late summer and occurred at all root levels, reaching 180 cm. in *Pirola secunda*. *Lathyrus vernus* and *Vicia sepium*, the only legumes found, showed root hairs, nodules (near the soil surface) and internal hyphae (at all levels).

[532] 631.466.2 : 576.809.7
CHEMICAL AND ENGINEERING NEWS. New antibiotic isolated from soil. *Chem. Engng. News* 25, 1947 (3746).

From a soil sample in Venezuela a species of *Streptomyces* was isolated whose culture media inhibited the growth of several pathogens, notably *S. paradyenteriae* and *Rickettsia prowazeki*. A crystalline antibiotic, chloromycetin, was isolated from the culture filtrates.

[533] 631.466.2 : 576.809.7
JOHNSTONE, D. B. Soil actinomycetes of Bikini Atoll with special reference to their antagonistic properties. *Soil Sci.* 64, 1947 (453-458). [N.J. Agric. Expt. Sta.]

Bikini soil is very dry, is composed of almost pure CaCO_3 and ranges from pH 8.7 to 9.2, except under tern rookeries where it contains more than 10% of organic matter. Where jungle litter accumulated there was little decomposition of plant parts. The number of micro-organisms was low, ranging from 3000 per gm. in soil free of vegetation to 59,000 in that adjacent to plant roots. Actinomycetes comprised 95% of the population, possibly owing to the alkalinity of the soil, and some were antagonistic to test bacteria, especially the acid-fast organisms. An undescribed species, *Streptomyces bikiniensis*, produced an antibiotic similar in many respects to streptomycin.

[534] 631.466.3
LUND, J. W. G. Observations on soil algae. III. Species of *Chlamydomonas* Ehr. in relation to variability within the genus. *New Phytol.* 46, 1947 (185-194). [Wray Castle, Ambleside]

Ten new species of *Chlamydomonas* found in soils are described, and characters which may be constant or variable within a species are discussed.

631.47 SURVEYS

[535] 631.47
GORRIE, R. M. Soil erosion survey and conservation working plans. *Indian Forester* 73, 1947 (65-70).

A fractional notation was used to define land types in an erosion survey in the Punjab. The numerator consists of a letter indicating land use, (C cultivated, F forest,

G grassland, R rock, S glacier or snow bridge, U unstable scree) and 3 digits (under C, F and G) giving detailed indications of the nature of the cropping, forest or grassland. The denominator consists of 5 digits indicating slope conditions, soil porosity, soil type (texture), soil erosiveness and liability to landslip. In districts where soil conservation is well established, erosion intensity is mapped on a simpler basis into 3 main groups (1) deeply ravined and seriously eroded, (2) not deeply ravined, but subject to serious sheet wash, and (3) wind erosion obvious.

[536] 631.47
DUYVERMAN, J. J. De landbouwscheikundige basis van het streekplan. [The agricultural-scientific basis of the district plan.] Thesis, Wageningen, 1947, pp. 344. [Du.]

Discussion of the effect of factors such as topography, ground water, geology and agricultural practices on the fertility of the soils of a fen (veen) district. Large numbers of soil- and plant-analyses are included.—S.H.

[537] 631.471
GUPTA, B. S. Scientific methods of recording soil and site characteristics in the field and collecting soil samples for laboratory examination. *Indian Forester* 73, 1947 (51-61).

Detailed instructions, modified, to suit Indian conditions, from those given in Clarke's *Study of the Soil in the Field*, as to how to record soil-survey data.

[538] 631.471.005
GARDNER, R. A. ; RETZER, J. L. A pocket-notebook form for soil-profile descriptions. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (474-479).

A form is described on which all the more important properties requiring notice in soil-survey work can be entered in the field.

631.48 SOIL FORMATION

(See also Abs. No. 496)

[539] 631.48 : 551.55
COLLIER, D. Importance des apports éoliens dans les sols apparemment autochtones de l'Auvergne. [Importance of wind transport in the apparently auto-

chthonous soils of Auvergne. *C.R.* 226, 1948 (193-194). [F.]

A sample was taken between depths of 6 and 20 cm. from soil above basalt surrounded by granites. These were bordered in the direction of the prevailing winds by other volcanic formations. Mineralogical analyses of the sample showed the presence of quartz and micas which could have been provided only by the granites 50-100 m. away and which must have been wind-borne. Evidence of wind transport has also been provided by observation of volcanic materials in the granitic soils of the Puys range and in calcareous clay soils. The importance of wind transport of materials from other sources varies with climatic conditions, vegetation and state of the soil, but it is a factor which should be remembered when comparing the different horizons of a profile and the parent rock.

[540] 631.483 : 551.58
ALVAREZ QUEROL, M. C. Variables que influyen sobre la razon molecular silice/alumina en los suelos graniticos españoles. [Variables affecting the silica-alumina ratio in granitic Spanish soils.] *An. Inst. Esp. Edafol.* 6, 1947 (233-308). [Sp.e.g.]

A statistical analysis of the results of chemical analysis of soils of Galicia and Central Spain established that the $\text{SiO}_2/\text{Al}_2\text{O}_3$ ratio has a positive linear relationship with temperature and a negative linear relationship with precipitation. The regression equation presented gives results almost identical with those of the equation deduced by Crowther, using a different statistical method on analyses of U.S. soils developed above igneous material. The ratio also varied positively with the CaO content of the clay fraction.

The mechanical analysis of Galician soils showed that the amount of their colloid content varied positively with both temperature and precipitation.

[541] 631.483 : 582.29
YARILOVA, E. A. [Rock lichens and the weathering of unstratified crystalline rocks.] *Pochvovedenie* 1947 (533-548). [R.]

Quantitative analysis of micaceous schist, amphibolite and the ash of the lichens *Haematomma ventosum*, *Squamaria rutina* and *Gyrophora cylindrica* growing on these

rocks showed the lichens to be concentrators of S, P, K and Ca. Microscopic study showed that the growth of *Rhizocarpon* on 5 different minerals caused considerable mechanical weathering. Lichens may be regarded as formative agents of the rudimentary soil. 60 references are given to early and recent work.

631.5 CULTURAL OPERATIONS

(See also Abs. Nos. 484, 487, 488, 507)

[542] 631.51 : 631.434
SPANNAGEL. Grundsätze der biologischen Bodenbewirtschaftung. [Principles of biological soil cultivation.] Imbshäuser Hefte No. 1, 1947 (45-52). [G.]

A discussion of the role of cultivation and tillage in favouring or destroying soil structure.

[543] 631.51 : 631.434
PAGE, J. B.; WILLARD, C. J.; MCCUEN, G. W. Progress report on tillage methods in preparing land for corn. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (77-80). [Ohio State Univ., Columbus]

Eight years' experiments with six treatments are reported. Treatments, with mean yield in bushels/acre, were:—(1) ploughing followed by discing (46.7); (2) use of sod plough with corn planted, as far as possible, directly in the surface of the upturned furrow slice (47.2); (3) rotary tillage, repeated three, and sometimes four, times to get a satisfactory seed-bed (42.1); (4) sub-surface tillage at about 7 inches with corn planted in the "trash mulch" (39.1); (5) minimum tillage, initially by roto-tiller, later by discing (34.5); (6) ploughing and discing as in (1), plus addition of heavy straw mulch (50.5). Results and comments include:—none of the treatments was better than ploughing for corn: response from rotary tillage was no better than ploughing, and in most years not as good: seed-beds prepared by rotary tillage were pulverized by heavy rain, and in two years had to be reworked to plant corn: in a very dry year, when all yields were low, roto-tillage was outstandingly good: non-ploughed plots were decidedly weedier: sub-surface tillage was generally unsatisfactory, and as erosion

control was not important nothing was gained by leaving plant residues on the surface: surface treatment was equally unsatisfactory and in at least one year plants showed K-deficiency symptoms on unfertilized sections: straw mulch plus ploughing showed little general benefit over ploughing alone: in the dry year the mulched-plot yields were appreciably lower.

Emphasis should be placed on soil condition rather than on the method by which it is produced. Zeal in seed-bed preparation may be misplaced, for the soil serves most of its time as a root-bed and the ideal conditions for a root-bed are frequently not compatible with the ideal conditions for a seed bed. Since structural stability is not high, a minimum of mechanical working is indicated, and the ideal soil condition appears to be approached most closely by ploughing, as it gives the necessary loosening with less destruction of structural units than any other tillage method.—H.L.P.

[544] 631.531.17 : 577.17
BECQUEREL, P.; ROUSSEAU, J. Action de quelques substances de croissance additionnées soit de nitrate d'urane, soit de sulphate de manganèse sur la germination et la productivité du blé. [Action of growth substances with uranium nitrate or manganese sulphate on the germination and productivity of wheat.] *C.R.* 225, 1947 (1106-1109). [F.]

Wheat grains were soaked in solutions of uranium nitrate and/or $MnSO_4$ at concentrations of 1/100-1/10,000, in the presence or absence of phenylacetic or β -indolylacetic acid. All the solutions caused more or less marked inhibition of germination. To study the effect on yields, grains were soaked in the various solutions, sown and harvested. $MnSO_4$ (1/10,000) + phenylacetic and β -indolylacetic acid (1/100,000) respectively gave yield increases of 30 and 24%.

[545] 631.581
FARKAS, A. Problema ogorului negru in Ardeal. [The problem of bare fallow in Transylvania.] *An. Fac. Agron. Cluj* 11, 1946 (246-263). [Rm.]

Of the natural factors rainfall was the most important in deciding whether the area of bare fallow should be extended in Transylvania.

[546] 631.584 : 631.581
RHEINWALD, H. Wechselwirkungen zwischen Bodenbearbeitung und Zwischenfrucht. [The mutual influence of tillage and catch crop.] *Imbshäuser Hefte* No. 1, 1947 (16-21). [G.]

The view is stated that catch-cropping should in general replace bare fallowing to protect the crumb structure from rain and the soil and its organisms from alternate drying-out and wetting, and to keep the deeper soil layers continually open by root penetration.

631.6 RECLAMATION IRRIGATION. DRAINAGE

(See also Abs. Nos. 420, 699, 701)

[547] 631.61
BENNETT, H. H. Engineering in soil conservation. *Agric. Engng.* 28, 1947 (559-562).

A summary of engineering principles involved in stubble-mulch farming, terrace and dam construction, drainage and irrigation.

[548] 631.62 : 626.862.6
SCHROEDER, E. W. An experimental mole ditcher. *Agric. Engng.* 28, 1947 (493-494, 502). [Pa. State Coll.]

A description is given of a light-weight machine on skids designed and built for the installation of experimental mole drains during an investigation on the improvement of wet clay soils. Failure of the drains within a year was attributed to chemical and physical changes in the soil caused by exposure of the soil wall of the drain to air and water rather than to collapse due to structural weakness or clogging.

[549] 631.622
DREIBELBIS, F. R. Some plant nutrient losses in gravitational water from monolith lysimeters at Coshocton, Ohio. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (182-188).

Plant-nutrient losses in drainage water from 2 silt loams, the first of which has a permeable and the second a rather impermeable subsoil, and which are under the rotation wheat-meadow-meadow-maize were, in

annual-average lb./acre, for the period 1940-1944: Ca 17.0 and 19.9; Mg 11, 10.3; K 5.9, 13.4; Mn 0.4, 0.3; N 4.6, 2.6; S 4.0, 17.8; Si 8.0, 9.0. Most of these losses occurred in winter and early spring.

On the second soil, an increase in the rate of application of mixed fertilizer and manure together with the application of limestone, decreased the removals of N, K, Mn and Si.

[550] 631.671
GHIGGIA, R. A. Medidor Parshall. Adaptacion de dimensiones y formulas al sistema metrico. [The Parshall flow meter. Adaptation of dimensions and formulae to the metric system.] *Rev. Fac. Agron. Univ. Montevideo* No. 44, 1947 (167-211). [Sp.]

Includes detailed correction and discharge tables and diagrams.

631.8 FERTILIZERS

(See also Abs. No. 651)

[551] 631.81 : 545
HARDESTY, J. O.; WHITTAKER, C. W.; ROSS, W. H. The air-flow method for the determination of moisture in fertilizers. *J. Assoc. Off. Agric. Chem.* 30, 1947 (640-648).

The method described for determining the free moisture present consists of drawing air heated to 60°C. through the sample for 2 hours. For samples containing easily oxidizable components it is superior to the present official method of oven heating at 100°C. for 5 hours.

[552] 631.81 : 545
ROSS, W. H.; LOVE, K. S. The determination of moisture in fertilizers. *J. Assoc. Off. Agric. Chem.* 30, 1947 (617-623).

The relative efficiencies of the air-flow method, the official method and the method of drying *in vacuo* over anhydrous magnesium perchlorate to determine free moisture were compared for various P, K and NH₃ fertilizers.

The air-flow method was satisfactory except perhaps for crystalline NH₄NO₃ containing occluded water, for which Fischer's solvent-extraction method could be used. For stable materials without occluded water or water of crystallization, all 3 methods gave similar results.

[553] 631.81 : 582.9 : 583.4
FREY, E.; OCHSNER, F. Flechten und Moose in den Versuchsflächen einer Nardusweide auf der Schinigeplatte bei Interlaken. [Lichens and mosses on the experimental plots of a Nardus pasture near Interlaken.] *Ber. Geobot. Inst. Rübel.* 1946, 1947 (23-50). [G.]

17 varied fertilizer and manurial treatments were applied both to natural-pasture plots and also to others which had been cleared and either re-seeded or left to natural re-establishment. Of the lichens, the acidophilous *Cladonias* disappeared not only on liming, but also especially on applying P, even at the natural pH of 4-5. N and K partly offset this effect of P. Of the mosses, some were calciphilous and others nitrophilous, but the influence of P and K ions was not clear. The thick plant cover caused by adding farmyard manure exterminated most moss species, including all nitrophiles, while shade-tolerating species survived.

631.811 PLANT NUTRITION

(See also Abs. Nos. 499, 615)

[554] 631.811
LUNT, H. A. Some remarks on the nutrition of plants. *J. N.Y. Bot. Gdn.* 48, No. 565, 1947 (11-17). *Biol. Abs.* 21 (1779). [Conn. Agric. Expt. Sta.]

[555] 631.811 : 631.414.3
TENDELOO, H. J. C.; VERVELDE, G. J.; ZWART VOORSPIJ, A. J. Electrochemical behaviour of ion-exchanging substances. II. Potential measurements on plant roots and their bearing on ion uptake by plants. *Rec. Trav. Chim.* 65, 1946 (539-544). [E.]

Assuming that the non-diffusible ion in the theory of the Donnan equilibrium originates from a substance which behaves as a weak acid, the concentration of its anion depending on the pH, fairly good agreement was obtained between the calculated and experimentally found figures for plant-root potentials.

[556] 631.811.1 : 581.144.4
CHIZHOV, B. A. Growth of leaves of summer wheat as influenced by nitrogen nutrition. *C.R. Acad. Sci. (URSS)* 52, 1946 (357-360). *B.A.B.III.* 1947 (151).

The occurrence of N deficiency is marked by production of shorter leaves, those developing at the time of the onset of deficiency being mainly affected. Comparison of leaf lengths with those of plants adequately supplied with N serves as an index of the need of N fertilizer, provided no other growth factor is deficient simultaneously.

[557] 631.811.7
WALKER, A. L., JR. Sulphur and agriculture. *Fert. Rev.* 22, No. 5, 1947 (3-5).

S is used as an ingredient of fungicides and insecticides and is a valuable ingredient of fertilizers. It plays a part in chlorophyll development, promotes strong root growth, increases nodule development in lucerne and red clover and stimulates seed production.

[558] 631.811.9 : 546.47
BERG, H. Sink som plantenæring og plantagift. [Zinc as a plant nutrient and plant poison.] *Nord. JordbrForsk.* 1947 (121-130). [N.]

Soil analysis showed that the Zn content of soils from a restricted area varied between 5 and 30,000 p.p.m., whereas the Zn content of plants from the same area varied between 20 and 1,200. Tentative limits for Zn deficiency or Zn poisoning are given as 50 p.p.m. and 200 p.p.m. of Zn in the straw of cereals calculated on a dry-matter basis. The Zn content of straw proved a better indicator of availability than that of the grain.

Available Zn of soils is estimated as the Zn extracted from soils by 0.1 n. $MgSO_4$ adjusted so as to maintain the soil reaction unaltered during the extraction. Preliminary results suggest that values below 1 p.p.m. indicate deficiency conditions for hay, and that cereal crops would require larger amounts of available Zn. Zn poisoning is potential when the values are over 100 p.p.m. on heavy humus-rich soils.—S.H.

[559] 631.811.9 : 632.112 : 581.192.6
SHKOLNIK, M. YA. [The minor-element problem in the light of the newest data.] *Priroda* No. 9, 1947 (42-49). [R.]

A review of the development of minor-element studies, with a discussion of the effect of minor elements on the resistance of plants to dry and to saline conditions. A solution of boracic acid and Mn salts sprinkled over cotton plants increased their salt tolerance; B increased the drought resistance of potatoes. B, Mn, Zn, Cu and Al increased the soluble-carbohydrate content of leaves and stems, thus increasing the water-retaining power of the cells. The hypothesis is advanced that the influence of minor elements on carbohydrate metabolism in plants is indirect, being exercised through an influence on the physico-chemical properties of the plasma colloids.

631.816 FERTILIZER APPLICATION

(See also Abs. No. 573)

[560] 631.816.3 : 629.135.2 : 546.73
ANDREWS, E. D.; PRICHARD, A. M. **Top-dressing cobalt-deficient land from the air.** *N.Z. J. Agric.* 75, 1947 (501-506).

An almost saturated solution of hydrated cobalt sulphate was distributed from the air with considerable evenness and accuracy under calm conditions. With winds of over 15 m.p.h. distribution was less satisfactory. This method offers a satisfactory control of bush sickness in hilly country where top-dressing with Co by hand or machinery is difficult. Details of aircraft used, effect of wind and flying technique are discussed.

631.821/2 LIME. AMENDMENTS

(See also Abs. Nos. 453, 454)

[561] 631.821.1
TRUOG, E. **The liming of soils.** *U.S.D.A. Yrbk.* 1943-1947, 1947 (566-576). [Univ. Wis.]

Discussion of U.S. research on subjects including the relationship between liming and the availability of B and Mn and of other plant nutrients, loss of lime by leaching and cropping, the cost of maintaining the lime supply, the relation of liming to the utilization of atmospheric N. pH 6.5 is an optimum reaction as regards the availability of N, P, K, S, Ca, Mg, B, Cu, Zn and Mn.

[562] 631.821.1 : 631.416.7
WANDER, I. W. **Calcium and phosphorus penetration in an orchard soil.** *Proc. Amer. Soc. Hort. Sci.* 49, 1947 (1-6). [Ohio Agric. Expt. Sta.]

Mulch had no effect in increasing the penetration of exchangeable Ca, applied in the form of ground limestone at 40 lb. per tree per year for three years. It had a slight effect in increasing the depth of penetration of readily available P applied as 20% super. at 20 lb. per tree per year for three years. Finely ground limestone used on both sod and mulch did not increase the Ca content of apple-tree leaves. Super. increased the P content of the leaves more when applied on sod than on mulch, although all phosphate treatments increased leaf P.

[563] 631.822 : 549.623.59
ROSEN, E. **Horticultural possibilities of vermiculite.** *Farm. Week. S. Africa* 73, Aug. 13, 1947 (81).

Vermiculite is a chemically inert, porous micaceous mineral which can absorb many times its weight of water and still retain large amounts of air. It is a very favourable medium for seed germination, and when added to a garden soil at a rate of 1½ lb. per square yard resulted in the production of bigger and more flowers, and the rate of growth of vegetables was increased. Bulbs kept very well when stored in cartons covered with dry vermiculite. It is suggested that it would be a useful medium for indoor floriculture or for the growth of vegetables in nutrient solution. Reference is made to recent American work with vermiculite.

631.83 POTASH FERTILIZERS

[564] 631.831 : 631.453
DYER, B.; HAMENCE, J. H.; TAYLOR, G. **The toxicity to plants of flue dusts containing cyanides and thiocyanates.** *J. Soc. Chem. Indust.* 66, 1947 (408-410).

Tomato plants are particularly susceptible to such flue dusts. For all other crops examined 1% of KCN and 1% of KCNS appear to be safe limits for these compounds in flue dust, but quantities in excess of these have been found to be toxic. Both cyanides and thiocyanate are rapidly destroyed in

the soil, and application of the dust to the soil some weeks before sowing the crop will afford a safeguard against these substances.

631.84 NITROGEN FERTILIZERS

(See also Abs. No. 628)

[565] 631.84:545
WYATT, J. H. Suggested modification of Jones-Robertson method for determination of nitrate nitrogen in fertilizers. *J. Assoc. Off. Agric. Chem.* 30, 1947 (207-208).

The official method may give low results with mixed fertilizers if organic matter is present, or high results if NH_4 salts are present. The modification suggested is to take 1.4 gm. of the sample if total N is not more than 10%, or 0.7 gm. if total N is more than 10%, add 5 gm. of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ and 90 ml. of a solution containing equal volumes of water, H_2SO_4 and HCl . Boil to fumes and continue as in the official method.

[566] 631.84:581.192
SNIDER, H. J. Effect of mineral nitrogen on the yield and protein content of farm crops. *Trans. Ill. St. Acad. Sci.* 39, 1946 (30-32). *Biol. Abs.* 21 (1767).

In field experiments the yield and protein content of maize was increased by the use of N fertilizers. Super. raised the P content, but an application of oat straw reduced the yield and P and protein content of maize. Yield and protein content of redtop and Kentucky blue grass hay were increased by applications of $(\text{NH}_4)_2\text{SO}_4$ and, on P-deficient soils, of super.

[567] 631.841.7:631.461
KUSIUZINA, L. A. [The effect of urea introduced into the soil on soil microflora.] *Mikrobiologia* 15, 1946 (391-397). [R.e.]

The introduction of urea into weakly acid (podzol) and weakly alkaline (chestnut) soils in which urobacteria were present favoured the development of the urobacteria and depressed the rest of the soil microflora. This effect is ascribed to the marked alkalization of the soil resulting from the introduction of urea.

[568] 631.841.8
ANDREWS, W. B. The use of anhydrous ammonia as a source of nitrogen. *Amer. Fert.* 107, No. 12, 1947 (9-10, 28); No. 13 (11, 24-28). [Miss. Agric. Expt. Sta.]

Anhydrous NH_3 , the cheapest form of N available, should be covered as it is applied to the soil to prevent loss into the air. It is converted into nitrate within 4 to 6 weeks in fertile, well aerated soils and more slowly in poor, heavy soils and during cold weather. As young plants respond better to ammonia than to nitrate while older plants prefer nitrate, ammonia should be applied at planting time. In 12 out of 19 trials in wet years to compare the effects on seed cotton of anhydrous NH_3 with those of NH_4NO_3 , the former was superior at depths of 4 and 6 inches. When applied as side dressings, yields were similar with both fertilizers. Similar results were obtained with maize, and for both crops the deeper application was superior.

As a side dressing for maize and cotton in a dry year anhydrous NH_3 applied 5 inches deep gave higher yields than NH_4NO_3 applied to the surface and ploughed in. When 32 lb./acre of N was applied to oats in autumn, anhydrous NH_3 was superior to NH_4NO_3 , but spring applications of NH_4NO_3 were much superior to autumn applications. Anhydrous NH_3 applied in autumn was especially good on strongly acid soils where the rate of nitrification was slow and the soil was able to retain the NH_3 until the spring.

[569] 631.842.4:631.812
MILLER, P.; SAEMAN, W. C. Properties of monocrystalline ammonium nitrate fertilizer. *Indust. Engng. Chem.* 40, 1948 (154-160). [TVA, Wilson Dam, Ala.]

Investigations of physical, storage and drillability properties indicated that monocrystalline NH_4NO_3 fertilizer as produced in a modified Oslo-Krystal pilot-plant vacuum crystallizer is equal or superior to commercially available forms. After storage in suitable bags for a year in a humid climate, the NH_4NO_3 was in a satisfactory form for direct application. Monocrystals can be satisfactorily conditioned with a dust only, 3-4% kieselguhr being the most effective. Crystallizing costs less than batch graining

and eliminates the explosion hazard in the evaporating steps of the graining and spray granulation processes.

[570] 631.847.2 : 631.461.51
ALLISON, F. E. ; GADDY, V. L. ; PINCK, L. A. ET AL. **Azotobacter inoculation of crops : II. Effect on crops under greenhouse conditions.** *Soil Sci.* 64, 1947 (489-497). [U.S.D.A. Beltsville, Md.]

In order to determine whether crop inoculation with *Azotobacter* is of value under a wide variety of conditions, neutralized, unsterilized loamy sand or loam treated with 2,000 lb./acre of 0-15-6 fertilizer and with solutions containing B, Cu, Zn, Mn and Mo was used. The test crops were Swiss chard, Sudan grass, rye, barley, kale and rape while Azotogen or pure cultures of *A. chroococcum* were the inoculants. No combination of soil, crop, source or method of inoculation, soil-N content or organic-matter supply resulted in an appreciable increase in yields or N content of the crops. Failure of the bacteria to benefit later crops provides strong evidence against the N-fixation theory advanced by Russian workers.

631.85 PHOSPHATE FERTILIZERS

(See also Abs. Nos. 529, 562, 638)

[571] 631.85 : 631.416.2
MARTENS, P. H. **Réflexions sur les relations existant entre la solubilité des phosphates et l'analyse des engrais phosphatés. [Reflections on the relationship between the solubility of phosphates and the analysis of phosphatic fertilizers.]** *Ann. Gembloux* 53, 1947 (269-276). [F.] [Inst. Agron. Gembloux]

Methods of determining P in phosphatic fertilizers and their solubility in water, NH_4 citrate, 2% citric acid and 2% citric acid saturated with Ca citrate are reviewed and discussed. The degree of solubility of alkaline phosphates, mono-, di-, and tri-Ca phosphates, rock phosphate, apatite, bone and slag in these solvents is indicated in a table.

[572] 631.85 : 631.815
SEMB, G. ; HOVLAND, G. **Undersøkelser over surhetsgrad og fosfattilstand på to jordstykker i 1940 og 1945. [Investigations on the degree of acidity and phosphate status of experimental plots from 1940 to 1945.]** *Tidsskr. Norske Landbr.* No. 6-7, 1946 (1-6). [N.]

On three farms which had received quantities of P in the years 1921-1940 and little in the years 1940-1945 there was little change in the average P requirement, determined by chemical analysis, of soil samples taken in 1940 and 1945.

[573] 631.85 : 631.816.3
WHITTAKER, C. W. ; COE, D. G. ; BARTHOLOMEW, R. P., ET AL. **Influence of placement on response of crops to calcium phosphates.** *J. Amer. Soc. Agron.* 39, 1947 (859-868).

In greenhouse experiments the effect of varying placement was tested on the response of crops to the calcium phosphates occurring in super., ammoniated super. and basic slag. Response to monocalcium phosphate was favourably affected by band placement. Localized placement gave greatly reduced yields with the dicalcium and tricalcium phosphate of ammoniated super. and the silicocarnotite of basic slag. Mixing with 2½-40% of soil greatly improved response to dicalcium phosphate and silicocarnotite, and, to a lesser degree, to tricalcium phosphate.

[574] 631.851 : 631.855
FINE, L. O. ; BARTHOLOMEW, R. P. **The fates of rock and superphosphate applied to a red podzolic soil.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (195-197).

Plots under the rotation maize-oats—wheat-clover were treated for 25 years with super. at the rate of 80 lb./acre of P_2O_5 per 4-year rotation or with rock phosphate at twice this rate. Yields from rock phosphate consistently approached those from super. only after 15 years. After 25 years the super. had maintained a nearly constant level of available and total P_2O_5 in the soil, whereas rock phosphate had increased the total P_2O_5 in the fine sand fractions by 120 and 166 p.p.m. over the super. and the manured control, respectively. About 60% of this increase was due to the persistence of rock-phosphate grains as such.

[575] 631.859.1 : 631.813
ROSS, W. H. ; ADAMS, J. R. ; HARDESTY, J. O., ET AL. **Factors affecting the availability of ammoniated superphosphates. Part II. The efficiency of ammoniated superphosphates as indicated by pot tests in the greenhouse.** *J. Assoc. Off. Agric. Chem.* 30, 1947 (624-640).

A comparison was made of the availability to plants (wheat, millet, sorghum and Sudan grass) of the P_2O_5 in mixed fertilizers ammoniated from 0 to 5% on the basis of the super. present. Ammoniation to 2%, with or without added dolomite, caused no decrease in availability provided the mixtures were stored at normal temperatures. Availability, especially in the presence of dolomite, decreased with ammoniation above 3% and with higher storage temperatures, was unaffected by the addition of fluorides to any mixture, but was lessened by increased moisture content. The official chemical method of determining available P_2O_5 gives high results for mixtures ammoniated beyond 2%, but is satisfactory up to this figure. Ammoniated super. is more effective on acid than on alkaline soils.

631.86/7 ORGANIC FERTILIZERS

(See also Abs. Nos. 469, 490, 636)

[576] 631.86/7 : 631.81 : 581.192
CHEN, C. Y. ; WANG, T. T. **Fertilizers and composition of vegetables.** *J. Agric. Assoc. China Suppl.* No. 50, 1945 (21).

The crude-protein content of the edible portions of the head cabbage was higher when fertilized with human excreta than with chemical fertilizers in both pot and field experiments. In Chinese cabbage the reverse was found in pot experiments.

[577] 631.87 : 634.61
TABAYOVONG, F. T. **The effects of the addition of copra meal to Los Baños clay loam.** *Philipp. Agricut.* 31, 1947 (52-59).

100 gm. of copra meal were added to one-gallon cans containing clay loam moistened to 60% of the water-holding capacity. This was repeated with successive batches of cans at weekly intervals, and lettuce seedlings were planted in each can at the ninth week.

After harvesting, the soils were loosened and replanted with lettuce to study the residual effects of the treatments. After the copra meal had decomposed the soil became darker, more friable and porous. Growth of the lettuce was retarded by undecomposed copra, but accelerated by meal which had been allowed to decompose for at least one week. The most suitable rate of application of copra meal was 100 gm. to 4.8 kg. of soil, and that of $(NH_4)_2SO_4$, 0.4 gm. to 4.8 kg. of soil. Copra meal was superior to $(NH_4)_2SO_4$ in respect to physical and chemical properties of the soil, growth and palatability of the lettuces and residual effect.

[578] 631.871 : 636.086.25
INSTITUT FÜR PFLANZENERNÄHRUNG, BODEN-CHEMIE UND BODENBIOLOGIE DER UNIVERSITÄT BERLIN. **Die Verwendung von unverrottetem Stroh zur Düngung. [The use of unrotted straw as manure.]** *Ztschr. Pflanz. Düng.* 37, 1946 (40-46). [G.]

In field studies in which potatoes were grown in a light, sandy loam 75 double centners per ha. of chopped straw were applied together with 0, 20, 40 and 60 kg. of mineral N. The straw depressed yields below those of the control plots even when added with N which, alone, increased yields. 1 and 2 years after the addition of straw, however, yields were higher on the straw+N than on the N-alone plots. Similar results were obtained in pot experiments with potatoes and with rye followed by barley. Yields of sugar beet were decreased by the addition of straw to leguminous green manure.

[579] 631.875 (083.72)
LENGLEN. **Composts et engrais composés. [Composts and compounded fertilizers.]** *C.R. Acad. Agric.* 33, 1947 (727-734). [F.]

The need is urged for closer legal definition of the terms "compost," "industrial composts," etc., in view of the prevalence in the fertilizer trade of "composts" based on animal scraps, fortified with mineral fertilizers, and having no claim to meet the shortage of farmyard manure.

[580] 631.875 : 631.812
TIMSON, S. D. **Kraal compost.** *Rhod. Agric. J.* 44, 1947 (476-487).

Crop wastes, grass, etc., are put under stock in kraals and to each 50 sq. yards of

kraal 6-12 bags of soil, 1-2 bags of wood ashes or $\frac{1}{3}$ - $\frac{2}{3}$ bag of agricultural lime are added, together with 50 lb. of rock phosphate if the waste materials are low in mineral content. The kraal is cleared out when the well-trampled waste is $1\frac{1}{2}$ feet deep, and the waste is made into heaps 4 feet high. After rain has penetrated to 6 inches the heaps should be turned. When wastes are low in N content and supplies of dung are insufficient, extra N may be supplied by growing legumes on the heaps before the first turning of the material.

Compost should be ploughed-under the day it is spread. 10-16 cu. yards/acre should be applied to maize or wheat on sandy soils. On heavy red, chocolate or black soils 12-20 cu. yards are necessary. 100-200 lb./acre of P fertilizer should be applied in addition to compost.

[581]

631.879.2

BEAR, F. E.; PRINCE, A. L. **Agricultural value of sewage sludge.** *N.J. Agric. Expt. Sta. Bull.* 733, 1947, pp. 12.

Plots receiving 20 tons of digested or undigested sludge (treated with lime and filter-pressed) or 2 tons of activated sludge per acre produced an average of 2.8 tons/acre less of silage maize than those receiving 20 tons/acre of cow manure. Addition of muriate of potash at 100 lb./acre to the activated sludge, and 10 lb./acre to the others, raised the yields to those given by manure. The manure, and all sludges except the undigested, had acid effects on the soil. Continued use of sludge would probably unbalance the soil with respect to one or other of the nutrient elements, and the land should be tested occasionally to determine the type and quantity of the supplements required.

[582]

631.879.2:631.812

FOWLER, G. J. **Some newly observed links in the nitrogen cycle.** *Proc. Natl. Inst. Sci. India* 13, 1947 (5-24).

A review of contributions to the understanding of the production processes of sewage sludge and the improvement of the product from the point of view of its agricultural utilization.

Addition of finely powdered cellulose material, e.g. chopped grass, to the aeration tanks of an activated-sludge plant removed

the soluble N from solution and built it into the sludge, which was easily drainable and was of the nature of humus. The soluble-N content of the effluent might thus be controlled in accordance with the needs of the plants receiving it. It is suggested that the mixing of highly active nitrifying sludge with incoming sewage would, given sufficient aeration, cause the nitrate present to become alternately reduced and re-formed from fresh additions of ammoniacal N, and that the humus material simultaneously produced would have a high N content due to the building of ammoniacal N into the bodies of micro-organisms.

632 PLANT DISEASES. WEEDS AND PESTS. PLANT PROTECTION

(See also Abs. Nos. 417, 433, 559, 601, 603, 606, 629, 632, 642, 661)

[583]

632.19:631.811.6

HESTER, J. B.; SMITH, G. E.; SHELTON, F. A. **The relation of rainfall, soil type and replaceable magnesium to deficiency symptoms.** *Proc. Amer. Soc. Hort. Sci.* 49, 1947 (304-308). [Riverton, N.J.]

Extreme Mg deficiency is likely to develop on sandy soils under conditions of high rainfall, heavy K manuring and low Mg content. Coastal-Plain soils have less available Mg than soils from other areas as the clay in the Coastal-Plain soils is of the kaolinite type which does not normally contain Mg. The application of commercial fertilizers which introduce large amounts of Ca, K, S, Cl and N, but smaller amounts of Mg into the soil, increases the depletion of Mg both by absorption due to greater growth of plants and by leaching. Mg deficiency was observed on sandy soils that had less than 100 lb./acre of replaceable Mg. Application of 200 lb./acre of $MgSO_4$ prevented the deficiency from developing.

[584]

632.19:631.811.9

FARMER'S WEEKLY. **Soil deficiencies corrected. Important findings of recent research on Cape coast conditions.** *Farm. Week. S. Africa* 74, 1947 (57).

Deficiency in trace elements in Cape soils may be due to excessive liming which renders trace elements insoluble. On Cape-coast soils deficient in Cu, an application of 30 lb./morgen of CuSO_4 to wheat land gave an increase of 60% in yield. On the Cape Flats, Mn deficiency is due partly to leaching caused by high summer temperatures which make the Mn soluble; in winter most of the soils are waterlogged and the Mn is drained away. These soils contain only 4 p.p.m. of Mn, which is mostly unavailable to plants because of the high lime content of the soils. 45 tons/morgen of farmyard manure to potatoes gave double the yield given by an equivalent quantity of commercial fertilizer. 40-50 lb. of MnSO_4 mixed immediately before application with 800 lb. of mixed fertilizer increased yields 60%. The residual effect of Mn on neutral or acid sandy soils was high, and even on calcareous soils crops benefited the following year. Chlorosis is caused by a lack of balance between Mn and Fe and may be remedied by applying MnSO_4 .

Rosette disease caused by Zn deficiency disappeared after applying ZnSO_4 to the soil.

[585] 632.4 : 631.432.2
MAGEE, C. J. **Sclerotium stem rot caused by *Sclerotium rolfsii***. *Agric. Gaz. N.S.W.* 58, 1947 (265-267).

High soil-moisture content and warmth favour the development of the fungus on vegetables, grasses, tobacco and fruit trees. The disease is most troublesome in soils rich in decaying vegetable matter. The susceptibility of plants is related to the extent to which they shade the soil and so increase local humidity. Soil dressings of 4-5 cwt./acre of $(\text{NH}_4)_2\text{SO}_4$ are reported to have reduced losses in some countries, and rotations with wheat and barley in autumn and winter reduce carry-over from summer to summer.

[586] 632.536
BRAID, K. W. **Bracken control—artificial and natural**. *J. Brit. Grassland Soc.* 2, 1947 (181-189). [W. Scot. Coll. Agric., Glasgow]

Bracken control by scything, ploughing, chemicals and trampling of stock is discussed. Summer ploughing followed by re-seeding and intensive grazing will eradicate bracken.

Drought kills the rhizomes better than frost, and plants growing on shallow soil die out during dry weather.

[587] 632.554.21 : 632.954 : 577.17
WOLCOTT, A. R. ; CARLSON, R. F. **Preliminary report on field applications of isopropylphenylcarbamate in the control of quack grass in an established sod**. *Mich. Agric. Expt. Sta. Quart. Bull.* 30, 1947 (218-229).

Surface applications of 30 lb./acre of IPC on an undisturbed sod delay bud development of quack grass for 30-60 days, but do not kill the rhizomes and inhibition is not permanent. If possible, IPC should be thoroughly incorporated mechanically with the soil, and efficiency may be increased by compaction after incorporation.

[588] 632.594.2 : 632.954 : 577.17
BRYANT, L. R. ; VINCENT, C. L. ; SCHAFER, E. G. **Bindweed control studies with 2,4-D in a bearing non-irrigated orchard in Eastern Washington**. *Proc. Amer. Soc. Hort. Sci.* 49, 1947 (63-66). [Wash. Agric. Expt. Sta.]

Materials containing the methyl ester, the alkanol amine salt, the butyl ester and the triethanol amine salt of 2,4-D at concentrations of 1500 and 2000 p.p.m. were most effective in both top and root kill of bindweed. The foliage and branches of the apple trees showed varietal differences in tolerance and resistance to these materials. Fruits from the sprayed orchard showed a rather large number of abnormalities in 1946 resulting from the applications of 2,4-D to the bindweed in 1945. These malformations may have been caused by the 2,4-D being translocated through the roots of the trees, from the material at the time the bindweed was sprayed or from volatile materials in the spray itself.

[589] 632.7 : 632.951
POST, R. L. ; MUNRO, J. A. ; KNAPP, R. B. **Chemical control of wireworms**. *N. Dak. Agric. Expt. Sta. Bimo. Bull.* 10, 1947 (26-31).

Benzene hexachloride was compared with chlordane and DDT, and effective control was obtained only from the application of 10% benzene hexachloride, applied by mechanical dusters and worked into the soil with a disc or harrow twenty-four hours

after the application was made. The treatment should be applied at least one month before seeding or planting a susceptible crop in order to give the insecticide time to destroy the wireworms.

[590] 632.7 : 632.951
GREENWOOD, D. E. **Benzene hexachloride and wireworm control.** *J. Econ. Ent.* 40, 1947 (724-727). [Conn. Agric. Expt. Sta.]

Concentrations and methods of application of benzene hexachloride to a fine sandy loam for the control of wireworms on potatoes were investigated. 2-2.5 lb./acre of crude benzene hexachloride diluted with pyrophyllite gave effective control. In general, row treatment was more effective, but the tubers tended to take up the taste of the insecticide.

[591] 632.7 : 632.951
PEPPER, B. B. ; WILSON, C. A. ; CAMPBELL, J. C. **Benzene hexachloride and other compounds for control of wireworms infesting potatoes.** *J. Econ. Ent.* 40, 1947 (727-780). [N.J. Agric. Expt. Sta.]

Good control of wireworms in potato fields was obtained by broadcasting 1.6 lb./acre of benzene hexachloride in autumn or 2 lb./acre in spring. 25 lb./acre of DDT gave 93.6% control and Rhothane (dichlorodiphenyldichloroethane) 80.1%. The only plant injury was a slight retardation of germination as a result of applying 10 lb./acre of benzene hexachloride.

[592] 632.7 : 632.951
RÉGNIER, R. Résultats des recherches de 1947 sur les vers blancs (*Melolontha melolontha* L.) [Results of 1947 research on the cockchafer larva *Melolontha melolontha* L.] *C.R. Acad. Agric.* 33, 1947 (684-690). [F.]

Beet, cereals, strawberry, salad and other crops may be devastated by this larva. Studies of its resistance to starvation, desiccation, flooding and the very effective organic chemicals hexachlorocyclohexane (HCH) and its S derivatives rich in γ isomers (SPC), the sulphonitrophenoxo ester SNP, and DDT (which is less effective), and of the effect of predators and cultural practices indicate the following measures to be taken in, say, 1948 in the regions subject to the various larval regimes :

(1) In regime-I regions, namely, those in which flights will originate in spring 1948, 15-20 kg./ha. of HCH or SPC products as a 0.5-1.0% suspension in water should be applied in May; alternatively, this may be done in July against the newly hatched larvae. Hoeing and weeding should be done at the time of egg-laying (early June or in the second half of June, if May was mild or cold respectively). (2) Regime-II regions, with third-year larvae in 1948 and flight in 1949 : in spring when the larvae are in the upper 5-10 cm. of soil, 2 or 3 late fast cultivations (6-7 km./hour) with the disc cultivator followed by a grubber should be given. HCH or SPC at 20 kg./ha. should be applied with the fertilizer or manure. (3) Regime-III regions, with second-year larvae in 1948 from the 1947 flights : HCH or SPC should be added in winter at 15-20 kg./ha. with the fertilizers, followed by spring cultivations as in (2) and stubble ploughing which should be done early, provided drought has not driven the larvae deep.

632.95 FUNGICIDES. HERBICIDES

(See also Abs. Nos. 524, 599, 605, 645, 650, 653, 675, 682, 685)

[593] 632.953
CHRISTIE, J. R. **Preliminary tests to determine the nematocidal and fungicidal properties of certain compounds when used as soil fumigants.** *Proc. Helminth. Soc. Wash.* 14, No. 1, 1947 (23-28). R.A.M. 27 (22).

1-2 c.c. of chloropicrin and allyl bromide per fumigating box 4 × 4 × 48 inches filled with sand were outstandingly better than all other fumigants tested for *Heterodera marioni* and *Fusarium oxysporum* f. *callistephi*.

[594] 632.953.005
BERAN, F. **Methoden zur Prüfung von Pflanzenschutz- und Vorratsschutzmitteln. XLI. Eine neue Methode zur Prüfung von Boden-Entseuchungsmitteln. [Methods of testing materials for protection of plants and stored products. XLI. A new**

method of testing soil disinfectants.]
ReichsPflSchBl. 2, No. 5, 1944 (72-75).
 R.A.E. 35 (424). [G.]

An apparatus for measuring the ability of a soil fumigant to penetrate the soil consists of a metal cylinder from which short metal tubes project. The cylinder is filled with a known weight of finely-sifted soil of suitable moisture content, the soil fumigant is inserted by pipette into the soil and at least 10 individuals of a test insect are placed in each of the projecting tubes which are then closed with rubber stoppers. From the known toxicity of the fumigant and the time taken to kill the insects the concentration of the fumigant in the tubes and hence its penetrative ability can be determined.

[595] 632.954
 PARHAM, B. E. V. **Weed control studies in Fiji. I. Methods and materials. II. Eradication of water hyacinth and other aquatic weeds.** *Fiji Agric. J.* 18, 1947 (35-42).

Biological, mechanical and chemical methods of weed control in pastures have been investigated. Only *Lantana aculeata* and *Clidemia hirta* were controlled by introduced insect parasites while, of the DNC and hormone preparations examined, MCPA combined with DNC was more toxic than either material used alone. Methoxone products were slower in action, but more permanent in effect than DNC which tended to burn, but not kill, grasses. No injury to livestock was recorded.

Investigations on the control of aquatic weeds, especially water hyacinth, have shown Weedone and Phenoxyl to be the most effective herbicides. The effect of Agroxone, which tends to run off glabrous foliage, is enhanced by the addition of small amounts of DNC. 0.15% solutions are recommended.

[596] 632.954 : 577.17
 PAT, Y. **Experiments with dichlorophenoxyacetic acid as a herbicide.** *Palestine J. Bot. (R)* 6, 1947 (55-57).

Spraying with 2,4-D at concentrations of 0.5% and more was very poisonous to young monocotyledons; weaker solutions were not sufficiently effective. The 2,4-D is absorbed by the roots of citrus seedlings and causes damage if applied to the soil near the root-crown or if brought in contact with the plants by irrigation water.

[597] 632.954 : 577.17 : 581.192
 RHODES, A.; TEMPLEMAN, W. G. **Effect of 4-chloro-2-methyl phenoxyacetic acid on the mineral content and growth of plants.** *Nature* 160, 1947 (825-826). [Jea-lott's Hill Res. Sta.]

In pot experiments, concentrations of the Na salt up to 0.5 p.p.m. were applied with the nutrient solution to rape, corn, chamomile (*Anthemis arvensis*) which was moderately susceptible, and oats which were most resistant.

With rape, swelling of root tips and presence of adventitious roots occurred after 7 days' treatment with 0.5 p.p.m.; top growth was slowed down and the percentage of K in the tops remained less than half of that in the untreated plants. P and Mg content were unaffected. With corn chamomile, the K percentage was hardly affected, and the root changes appeared after 17 days with 0.5 p.p.m. With spring oats, the only significant effect was on the roots after 28 days.

633.1 CEREALS

(See also Abs. Nos. 543, 690, 734)

[598] 633.1-1.84 : 581.192
 ÅBERG, Å. **Sort- och kvävegödslingsförsök med höstveten vid Ultuna och Svalöf 1942-1946. [Variety and nitrogen-fertilizer trials with winter wheat at Ultuna and Svalöf, 1942-1946.]** *Sverig. Utsädesfören. Tidskr.* 57, 1947 (385-418). [Sw.e.]

Ca(NO₃)₂ was given at an early stage of development and at three subsequent intervals of 2 (Ultuna) or 3 (Svalöf) weeks. The treatments were distinguished as early, optimal, rather late and late. The general response to N was quite different at the two places, but at both, late applications of N markedly increased the protein content of the grain, and reduced the yield in comparison with that obtained with early application. Economically, the best result was obtained by adding N at the optimal stage. There were no significant differences between varieties in their reaction to time of fertilizing.

[599] 633.I-2.954: 577.17
CHABROLIN, C.; THELLOT, B. Essais comparatifs des dérivés nitrés des phénols et des phytohormones, en vue du désherbage sélectif des céréales. [Comparative studies of the nitrogen derivatives of phenols and phytohormones, in relation to selective weedkilling in cereals.] *C.R. Acad. Agric.* 33, 1947 (661-665). [F.]

About twenty N, Cl and nitro-chloro derivatives of phenols and cresols were tested as herbicides in the form of salts of one or more of Na, K, Al, NH₄, or as butyl esters. NH₄ dinitrocresylate was the most effective compound at 1000 l. of 0.3-0.5% solution per ha. The Al salt and the ester had a comparable effect, but the Na and K salts needed twice the concentration. NH₄ dinitrophenate at 1000 l. of 0.5-1.0% solution per ha. destroyed most species of annual dicotyledons. The above doses may be quintupled without harming wheat, but a double dose may damage oats. Of the 18 chlorophenoxyacetic-acid derivatives tested, the Na and NH₄ salts of the mono- and tri-acids were less effective than those of the di- (2,4-D) form or than Na monochloromethylphenoxyacetate, and with 2,4-D, replacement of Na by hydrazine or ethanolamine gave no advantage. These compounds, which should be applied at rates of 0.5-1.0 kg./ha., are less widely efficacious than NH₄ dinitrophenate, and should be used only for weeding cereal crops and destroying thistles. The nitro-, chloro-nitro, and chlorosulphonic derivatives have no phytohormone effect.

[600] 633.II-1.84-1.816.2: 664.641.016
ÅKERMAN, Å. Bakningsförsök med höstvetesorter från kombinerade sort- och kvävegödslingsförsöken på Svalöf. [Baking tests with winter wheat from the combined variety and nitrogen-fertilizer trials at Svalöf.] *Sverig. Utsädesfören. Tidskr.* 57, 1947 (419-426). [Sw.e.]

Baking quality of the flour was improved by late applications of N which increased the protein content of the flour, the weight of the dough and the volume of the bread.

[601] 633.II-2.4-1.432.2
SABOUROVA, P. V. [Physiological characteristics of wheat infected by *Puccinia triticina* at different soil humidities.]

Bot. Zh. S.S.S.R. 31, No. 4, 1946 (35-48). R.A.M. 27 (11). [R.e.]

It is suggested that soil moisture acts indirectly on infection by *Puccinia triticina* by determining the physiological state of the host. Increase of protein and sugar content at high soil moisture probably accounts for greater susceptibility of wheat to brown rust.

[602] 633.II-2.4-1.466.1
SLAGG, C. M.; FELLOWS, H. Effects of certain soil fungi and their by-products on *Ophiobolus graminis*. *J. Agric. Res.* 75, 1947 (279-293). [U.S.D.A. and Kansas Agric. Expt. Sta.]

Fungi capable of producing substances that inhibit the growth of *Ophiobolus graminis* in pure culture and of preventing or lessening infection of wheat by *O. graminis* in soil were isolated from soils. Several soil fungi decreased the pathogenicity of *O. graminis* on wheat in both artificially inoculated and in naturally infested soil.

[603] 633.II-2.4-1.582
WHITE, N. H. The etiology of take-all disease of wheat. 3. Factors concerned with the development of take-all symptoms in wheat. 4. The effect of agronomic practices on the incidence and severity of take-all. *Aust. J. Coun. Sci. Indust. Res.* 20, 1947 (66-86).

In wheat grown in steam-sterilized soil no take-all symptoms occurred. In steam-sterilized soil inoculated with *Ophiobolus graminis* and with a dry top soil maintained throughout the growing period, take-all symptoms developed in all plants. Two years' bare fallow eradicated *O. graminis* from the soil. Cropping to wheat for 4 years increased the disease and decreased crop vigour. One year's fallow or oats in rotation with wheat or an oats-fallow-wheat rotation decreased the severity of the disease and increased yield.

[604] 633.II-2.4-1.81
ANGELL, H. R. The influence of fertilizers on take-all of wheat. *Aust. J. Coun. Sci. Indust. Res.* 20, 1947 (372-378).

Infection of roots of wheat by *Ophiobolus graminis* is not apparently related to ordinary fertilizer treatments, as infection in differently fertilized plots in a randomized block was not significantly different from that of the

controls. The development of the disease, as gauged by the percentage of whiteheads, i.e. empty or nearly empty heads, is closely associated with treatment of the soil. With an adequate supply of soil moisture, control was obtained in plots to which a mixture of inorganic N fertilizer and super. was applied. It is confirmed that in years in which soil moisture is not a limiting factor, control of take-all depends on proper nutrition.

[605] 633.11-2.954
TILT, J. **Weed control of cereal crops by means of selective sprays.** *Tasm. J. Agric.* 18, 1947 (169-171).

Wheat growing on gravelly clay of low fertility was treated with (1) 120 gallons/acre of 1½% Dinoc, (2) as above + 4 lb./acre of $(\text{NH}_4)_2\text{SO}_4$, (3) 120 gallons/acre of 0.1% (active principle) Methoxone, (4) 200 lb./acre of 1% Methoxone dust. Dinoc + $(\text{NH}_4)_2\text{SO}_4$ gave a 50% kill of wild radish (*Raphanus raphanistrum*), and the remaining plants were reduced in size. The wheat yield was 83% higher than the control. Dinoc alone was inferior to (2); wild radish was stunted, and wheat yield was 38% above the control. Methoxone spray gave almost complete kill of wild radish and increased wheat yield by 100%. Methoxone dust was slow in action and gave less complete kill than the spray.

[606] 633.13-2.191-1.461 : 546.711
CANADA, MINISTER OF AGRICULTURE. **Soil micro-organisms in relation to manganese deficiency in oats.** *Canada Rept. Min. Agric.* 1946-47, 1947 (31).

A variety of oats susceptible to disease harboured in its rhizosphere larger numbers of Mn-oxidizing, casein-hydrolysing and denitrifying bacteria than a resistant variety. Chloropicrin, cyanogas and formaldehyde reduced the numbers of bacteria, and plants grown on treated soil were free from symptoms of Mn deficiency. Application of straw mulch increased numbers of Mn-oxidizing and cellulose-decomposing bacteria. Application of 190 lb./acre of calcium cyanamide controlled the disease.

[607] 633.13-2.191-1.461 : 546.711
TIMONIN, M. I. **Microflora of the rhizosphere in relation to the manganese-deficiency disease of oats.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (284-292). [Dept. Agric., Ottawa]

Studies were made on soils at the Central Experimental Farm at Ottawa from areas giving rise to grey-speck disease in oats compared with areas supporting a healthy crop. Oats of varieties resistant and susceptible to grey speck were grown, using sterilized and unsterilized soils of both types, with and without the addition of fertilizers, Mn and barnyard manure. The numbers of various groups of bacteria, fungi and actinomycetes in the rhizosphere of the resistant variety were compared with those of the susceptible.

The rhizosphere of the susceptible variety contained higher numbers of bacteria than that of a resistant variety grown under identical conditions. In untreated soil the numbers were 564.2 million per gm. for the susceptible and 266.3 million for the resistant; in soil with manure and MnSO_4 (28.4 + 0.142 gm. per 1-gallon pot) the numbers were 638.3 as against 508.7 million per gm. The numbers of bacteria capable of oxidizing Mn, hydrolysing casein, denitrifying, and decomposing cellulose were very much higher in the rhizosphere of the susceptible plants than in the resistant, both in treated and untreated soils. The numbers of fungi were higher in the resistant than in the susceptible plant rhizosphere; no significant differences were found for the actinomycetes.

When soil was treated with fumigants (chloropicrin, $\text{Ca}(\text{CN})_2$, formaldehyde) the numbers of manganese-oxidizing bacteria were very much reduced, and the plants were free from grey-speck symptoms and showed a marked increase in grain yield. Straw mulch applied to the soil had the reverse effect.

A significant positive correlation was found between the severity of the disease and the numbers of manganese-oxidizing (+ 0.8939) and cellulose-decomposing (+ 0.6117) bacteria.—L.M.C.

[608] 633.15-1.5
DU TOIT, J. J. **The production of maize.** *Farm. S. Africa* 22, 1947 (849-856, 862). [Potchefstroom]

Most soils in the summer-rainfall area are deficient in P and organic matter. 200-400 lb./morgen of 15% super. is recommended. Application of K has a depressing effect on grain yields, 4 tons of manure + 400 lb./morgen of super. gave the best results.

Manure alone gave higher yields than super. alone. For the first 5 years of application the yield from rock phosphate was lower than from super., but for the last 10 years rock phosphate has given better yields than super. and as good as kraal manure. The application of kraal manure for 24 years has had no effect on either colour or texture of the soil.

On areas with 28 inches or more of rain, fertilizer should be applied in rows. In areas with lower rainfall fertilizer should be broadcast and ploughed under in winter or worked in with a disc harrow. Weeds can be controlled by harrowing when the maize is 3, 6 and 9-12 inches high and thereafter by regular cultivation. Maize should be rotated with a legume which receives no fertilizer. On exhausted land a quarter should be in semi-permanent grass in rotation with maize, maize and legume.

[609] 633.15-2.954 : 577.17
HAMNER, C. L. ; TUKEY, H. B. ; CARLSON, R. F. **Application of 2,4-dichlorophenoxyacetic acid to soil as a pre-emergence spray to prevent lodging and to control weeds in sweet corn.** *Mich. Agric. Expt. Sta. Quart. Bull.* 30, 1947 (194-199).

The toxic effect of 2,4-D remains in the soil for about 2 weeks and has almost disappeared after 4 weeks. The rate of dissipation depends on soil moisture and temperature, and under dry conditions and low temperature it may persist in the soil for a considerable time. If 5 lb./acre of the Na salt be applied to warm moist soil, over 95% of the weed seeds are destroyed in the upper 2-3 inches. Applications were most effective on light sandy soils and least effective on muck soils. Weed control was effective when a 70% preparation of the Na salt was applied to the soil at rates of 5, 10 and 20 lb./acre immediately after sowing maize. Growth of the maize was slightly retarded with 10 and 20 lb./acre, but no adverse effect was noted on growth, yield or quality of maize on using 5 lb./acre. Tiers of adventitious brace roots developed on all plots receiving 2,4-D, but were most marked with 5 lb./acre applications. These roots anchor the plants and prevent them blowing over. With 2,4-D applications, cultivation is unnecessary.

[610] 633.17-1.821.1
LYONS, E. S. **Lime increases sorgo yields.** *J. Amer. Soc. Agron.* 39, 1947 (1094).

Large yield increases were obtained from one application of lime equivalent to 1000 lb./acre of CaO when the sorgo plants were 3 inches high. The effect of the lime lasted for 3 years.

[611] 633.18 : 581.192.6
DEL VALLE, C. G. ; BABÉ, E. **Tolerancia del arroz al cloruro de sodio en cultivos de aniego. [Sodium-chloride tolerance of inundated rice.]** *Estac. Expt. Agron. Habana Bol.* 66, 1947, pp. 16. [Sp.]

In pot experiments, using a clay loam soil, rice plants 30, 60 or 90 days old were subjected until 164 days old to one of 5 steady concentrations of NaCl (0.15-1.0%), the pH remaining at 7. The treatment retarded flowering by 5-13 days, and the NaCl content of the plants varied directly with the salt concentration and length of irrigation, from 0.25% in the control without salt to 6.21% in 30-day plants subjected to a 1% concentration.

Concentrations of 0.15 and 0.25% greatly lowered the number of grains produced by the 30- and 60-day groups respectively; 0.25 and 0.35% decreased grain size in the two groups, while 0.5% prevented grain formation and killed some plants in 60-110 days. 90-day plants were hardly affected by the concentrations used. Symptoms of NaCl toxicity are a darkening of the green colour, withering of leaf tips, yellowing and death.

[612] 633.18-1.5
YANG, S. J. **[The cultivation of regenerated rice and its future in Hunan and Szechuan.]** *Nung Pao* 5, 1940 (46-52).

Briefly, the cultivation of regenerated rice consists of harvesting an early rice and leaving the stalks to regenerate new tillers for a second crop. The practice is found in Japan, Formosa and part of China, especially in Hunan, Hupei, Szechuan, and Kweichow provinces where the climate and water supply are suitable. The present paper gives a comprehensive survey of the practice and a thorough discussion of its various aspects.

The problem of cultivation is resolved into several factors, (1) water supply and depth of flooding, (2) soil fertility and fertilization,

(3) variety differences and harvesting time, (4) length of the remaining stalks, (5) lodging, (6) ploughing, (7) influence on winter crops and green manures, and (8) losses due to insects and birds. The yield of the regenerated rice is between 50-150 cattles per mou, about 20-30% of the first crop. The quality is better than the first harvest, it is less uniform but much more palatable. The combined yield of the 2 harvests is about the same as that of 2 consecutive plantings in one year at the same locality.

Regenerated rice is of special importance in a bad year when the first harvest is poor. This is especially marked after drought, but is not so significant after flood, wind or insect damages when most plants fail to regenerate.

The government plan of promoting regenerated rice is discussed, and a thorough investigation of local practice and land utilization is urged. Improved cultivation of regenerated rice is believed to be a simple and effective way of increasing food production.

633.2/3 GRASSES. LEGUMES

(See also Abs. No. 491)

[613] 633.2.03-1.51
RIEDEL, A. Forage yields (1945) of various native pasture grasses established artificially at Hays, Kansas, in 1941. *Trans. Kans. Acad. Sci.* 50, 1947 (175-190). [Kans. State Coll. Hays]

Plots of buffalo (*Buchloe dactyloides*) and blue grama (*Bouteloua gracilis*) grasses were established on good, fertile, upland seed beds which received the following treatments:— (1) the soil was double disced and double packed before planting and clipped every 2-3 weeks after seeding, (2) the seed bed was uncultivated prior to planting and clipped twice during the season and (3) the soil was uncultivated and the weeds unclipped. No further treatments were given before 1945. Both grasses then gave greatest basal cover and yield after (1) and least after (3).

[614] 633.2.03-1.81 : 581.192
MILTON, W. E. J.; DAVIES, R. O. The yield, botanical and chemical composition of natural hill herbage under manuring, controlled grazing and hay

conditions. *J. Ecol.* 35, 1947 (65-95). [Pl. Breeding Sta., Aberystwyth]

The lime content of native herbage deteriorates with time, and application of limestone increases both Ca and P content to the level found in good lowland pasture, and increases the starch and protein content. The application of super. alone had not such a great effect on yield of dry matter, protein or lime. Plots receiving lime + complete fertilizer gave the best results.

[615] 633.3 : 546.27
ROGERS, H. T. Boron response and tolerance of several legumes to borax. *J. Amer. Soc. Agron.* 39, 1947 (897-913). [Ala. Agric. Expt. Sta.]

Lucerne produced on the average 58% (1807 lb./acre) more hay with borax than without; with borax, bur clover gave an average increase of 104% and crimson-clover seed production was increased by 259 lb./acre. The legumes responding to B included vetch for seed and red and white clover. B may stimulate seed production of a number of legumes which show no vegetative response. Blue lupin, soybeans, alyce clover (*Alysicarpus vaginalis*), peanuts and sericea did not respond to added B on soils highly deficient in B. Placement experiments indicated that B should be applied with other fertilizer materials, preferably two weeks before seeding, as severe injury was caused to clovers and Austrian winter peas by application of 15 lb./acre of borax at seeding.

[616] 633.3-1.416.327
ROGERS, H. T. Water-soluble boron in coarse-textured soils in relation to need of boron fertilization for legumes. *J. Amer. Soc. Agron.* 39, 1947 (914-928). [Ala. Agric. Expt. Sta.]

A hot-water extraction method of determining available B made it possible to select untreated areas where response to borax might be expected, but failed to assist prediction of the degree of response on deficient areas. It was concluded that lucerne, although it has high B requirements, needs very small amounts of B when grown on soils with a low Ca supply and low base-exchange capacity. B fixation is probably chemical rather than biological, as sterilizing soil with toluene had no effect on B fixation.

[617] 633.31-1.81
HEYNS, O. S. Dryland lucerne in the south-eastern Orange Free State. *Farm. S. Africa* 22, 1947 (419-422).

Lucerne is recommended as a resting crop for areas in the Orange Free State where continuous cultivation of maize and/or winter cereals is causing exhaustion and deterioration of the soil. The soils are derived mainly from dolerite or sandstone. The dolerite soils are red clayey loams, rich in Ca but poor in P. The sandstone soils are sandy loams, poor in Ca and P. Not less than 400 lb./morgen of super. should be applied to both types, and at least 2 tons/morgen of agricultural lime is essential on the sandstone soils. Both should be ploughed in deeply before lucerne is sown. Lucerne grown with lime was less severely damaged by frost than crops receiving no lime.

[618] 633.32-1.461.52
ERDMAN, L. W. Strain variation and host specificity of *Rhizobium trifolii* on different species of *Trifolium*. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (255-259). [U.S.D.A., Beltsville]

A study was made of the efficiency of 15 strains of *Rhizobium trifolii*, obtained from ten *Trifolium* species. Each strain was inoculated into jars containing seedlings of four clover species: *Trifolium alexandrinum*, *T. fragiferum*, *T. subterraneum* and *T. resupinatum*. No one strain was equally effective with each of the four species, the variation being considerable. The number of nodules formed was not a reliable indication of the amount of N in the crop, nor of the total yield. Maximum growth and fixation depend upon the use of an effective strain of *Rhizobium*.—L.M.C.

[619] 633.326-1.811.3
ROSSITER, R. C. The effect of potassium on the growth of subterranean clover and other pasture plants on Crawley sand. 2. Field-plot experiments. *Aust. J. Coun. Sci. Indust. Res.* 20, 1947 (389-401).

In preliminary field-plot trials 1 cwt./acre of KCl produced a highly significant increase in yield of subterranean clover (on a dry-weight basis), a barely significant increase of Wimmera ryegrass (*Lolium rigidum* Gaud.) and depressed yields of lupins and miscellaneous pasture species.

Main trials were carried out on a twice-cultivated site cleared from virgin forest where a mixture comprising 12 lb. of subterranean clover and 4 lb. of perennial-veldt grass (*Ehrharta calycina* Sm.) was sown per acre. 18 treatments were distributed according to the scheme:—

$$\left. \begin{matrix} P_0 \\ P_1 \\ P_2 \end{matrix} \right\} 3 \times \left. \begin{matrix} K_0 \\ K_1 \\ K_2 \end{matrix} \right\} 3 \times \left. \begin{matrix} M_0 \\ M_1 \end{matrix} \right\} 2$$

where P_1 and P_2 represent 2 and 4 cwt./acre of super., K_1 and K_2 represent 1 and 2 cwt./acre of KCl and M_1 represents 15 lb. of $MgSO_4$, 5 lb. of $CaSO_4$ and 5 lb. of $ZnSO_4$ per acre. On a dry-weight basis no response was shown by either perennial-veldt grass or the miscellaneous species during the first season. The effects on the clover of M_1 were extremely small, but those of P and K were highly significant. P alone increased yields 5- to 6-fold and KP produced 3-fold increases compared with PK_0 treatments. In the second year clover was almost absent on the P_0 plots and seedling density was low on the PK_0 plots. Beneficial effects of P but not of K on perennial veldt grass were shown throughout the season and this may be accounted for by the increased soil-N status after the growth of clover, resulting in a $N \times P$ interaction effect.

K-deficiency symptoms in subterranean clover and the mineral status of deficient herbage are described in detail. K-deficient leaves of subterranean clover showed a high relative content of Na but no excess of Ca despite the high exchangeable-Ca status of the soil type studied.

[620] 633.34-1.4
BULCOCK, F. W.; MULLETT, H. A.; MCKEON, C. J., ET AL. The soybean industry and its possible establishment in Australia. Report of the Commonwealth mission of investigation into the industry in U.S.A. *J. Dept. Agric. Victoria* 45, 1947 (397-414, 455-467).

In a review of the present status of the soybean industry in the U.S.A. suitable soils and climate are described. Soybeans grow well on maize soils, best results being obtained from highly fertile loams, preferably alkaline. Two suitable Iowa soils are silty, mildly acid in the upper parts of the profile but alkaline in the subsoil, easily worked, well drained and well supplied with N and P.

Some similarity to these soils is shown by the black earths, red loams and alluvial soils in the podzolic region of E. Australia. A study of climatic factors suggests that in Australia experimental work should be concentrated in the zone with a minimum rainfall of 12 inches during the growing period. Soybeans tend to leave the soil in an "ashy" condition with a tendency to erode if sown immediately to row crops. In U.S.A., rotations with maize, oats, wheat, legumes and hay are usual.

[621] 633.34-1.81
NELSON, W. L. **Fertilizing soybeans : lime, potash and phosphates are needed.** *Res. and Farm.* 4, No. 3, 1946 (4-5, 9). Biol. Abs. 21 (1764).

Fertilizer tests on several soil types indicated that yields of 25-40 bu./acre may be expected if Ca, K and P requirements are fulfilled. The treatments would vary according to the preceding crop.

[622] 633.34-1.84
THORNTON, G. D. **Greenhouse studies of nitrogen fertilization of soybeans and lespedeza using isotopic nitrogen.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (249-251). [Fla. Agric. Expt. Sta.]

It is known that soybeans can utilize more N than is provided by nodule fixation. Soybean-seeds were inoculated with a suspension of *Rhizobium japonicum* from week-old cultures on agar, and were grown in a soil-sand mixture very low in available nitrogen. Nitrogen was given as $\text{Ca}(\text{NO}_3)_2$ enriched with N^{15} . Addition of combined N to soybeans at time of planting significantly reduced the number of nodules per plant. The greater part of the combined N added at planting was found in the tops and roots, but when the N was added at mid-season the greater part was found in the seed; the addition of combined N at mid-season to well nodulated plants significantly increased the yield; some symbiotic N fixation occurred even in the presence of an adequate amount of combined N. Lespedeza was also used but the results from this crop were not clear.—L.M.C.

[623] 633.34-1.85 : 581.192
FULEKY, G. [Effect of fertilization and inoculation on the protein and oil con-

tents of soybeans.] *Kiserl. Közlem.* 46, 1943 (304-309). C.A. 41 (7613).

Experiments on plots of well cultivated soil, using 170 kg. of nitrate, 170 kg. of 40% K_2O , 250 kg. of super., 250 kg. of "Ca phosphate" and 9 kg. of borax in five trials proved that use of phosphates increased slightly the content of crude protein. Application of B had good effect on protein content and very slightly increased the ash content.

633.491 POTATOES

[624] 633.491 : 546.27 : 581.192
CALDWELL, J. S.; CULPEPPER, C. W.; BROWN, B. E. **Effect of boron in fertilizer upon quality of dehydrated white potatoes.** *Amer. Potato J.* 24, 1947 (397-412).

There was no evidence of injury to fresh tubers and their dehydrated products. Added B appeared to be beneficial in that tubers were less discoloured on the B-treated than on the control plots. With one variety the beneficial effect of B was apparent on all four soils used in the experiment, whereas with another variety it was apparent only on one soil.

[625] 633.491 : 577.17
SMITH, O.; BAEZA, M. A.; ELLISON, J. H. **Response of potato plants to spray applications of certain growth-regulating substances.** *Bot. Gaz.* 108, 1947 (421-431). Biol. Abs. 21 (1783). [Cornell Univ., Ithaca]

Applications of 10,000 p.p.m. of methyl α -naphthaleneacetate at the rate of 55 gallons per acre resulted in reduced yields and specific gravity of potato tubers and in a pitted, scab-like injury. Applications of 10 p.p.m. of the Na salt of 2,4-D, 150 p.p.m. of naphthaleneacetic acid and 150 p.p.m. of indoleacetic acid did not affect vine growth, yields, specific gravity of the tubers or reducing-sugar content.

[626] 633.491-1.415.1 : 581.144.2
GOEDEWAAGEN, M. A. J.; WILLIGEN, A. H. A. DE. **Over de beworteling van verschillende aardappelvassen en de invloed die de zuurgraad van de grond daarop uitoefent.** [On the root development of different potato varieties and its relation

to the acidity of the soil.] *Landbouwk. Tijdschr.* 59, 1947 (504-510). [Du.e.] [Landbouwproefst. Bodemk. Inst. T.N.O.]

7 varieties of potatoes were grown in soils ranging in reaction from pH 4.55 to 6.3. Some weeks before harvesting, the root concentration expressed in mg. of dry roots per litre of soil was determined in the 0-10-cm. and 10-20-cm. layers at a distance of 30 cm. from the plants. The root concentrations, which varied considerably with variety, were unrelated to the yield of tubers and were at a maximum between pH 4.55 and 5.5. The yield optima lay between pH 4.9 and 6.3 according to the variety. A low pH optimum for the yield corresponded with a low maximum for root concentration.

[627]

633.491-1.81

NELSON, W. L.; HAWKINS, A. Response of Irish potatoes to phosphorus and potassium on soils having different levels of these nutrients in Maine and North Carolina. *J. Amer. Soc. Agron.* 39, 1947 (1053-1067). [N.C. Agric. Expt. Sta. and U.S.D.A.]

Applications of P and K gave significant responses which tended to decrease as the amounts of readily soluble P and exchangeable K in the soil increased. P and K contents of leaves were related to the amounts of readily soluble P and exchangeable K in the soil and to the amounts of P and K applied. P was particularly important in influencing the number of tubers per hill on soils low in readily soluble P. Considerably more K is applied in Maine than is necessary for maximum yields. In North Carolina increased yields may be obtained with more than 120 lb./acre of K_2O .

[628]

633.491-2-1.84

KOBLET, R. Untersuchungen über den Einfluss der Stickstoffdüngung auf den Krankheitsbefall und die Speisequalität der Kartoffel. I. [Studies on the influence of nitrogen fertilizers on the incidence of disease and the eating quality of potatoes. I.] *Landw. Jahrb. Schweiz* 61, 1947 (666-699). [G.f.]

In 30 four-year field experiments potato crops were treated with farmyard manure, 50 kg./ha. of P_2O_5 as super., 70 kg./ha. of K_2O as K_2SO_4 and 30, 60 or 90 kg./ha. of N as $Ca(NO_3)_2$. The presence of diseases was

noted at the beginning and end of the storage period. The appearance of rust and a brown colouring of the vascular bundles were independent of the fertilizing system. The heavier applications of N appeared to favour the incidence of *Phytophthora infestans* and, in certain varieties, of black or grey patches, especially in those tubers which were roughly handled. To prevent the occurrence of blackening it is recommended that well-balanced fertilizers containing some but not an excess of N should be applied, that tubers should be handled carefully and that suitable varieties be chosen. The effect of fertilizers on flavour was not established.

[629]

633.491-2.19-1.811.4

WALLACE, T.; HEWITT, E. J. Effects of calcium deficiency on potato sets in acid soils. *Nature* 161, 1948 (28). [Long Ashton]

Results of sand-culture experiments indicate that the hard-tuber condition in potatoes grown in acid soils is due to the dying back of young shoots before emergence. This is caused by Ca deficiency and not by the toxic effects of elements such as Mn and Al.

[630]

633.491-2.192: 546.711

BERGER, K. C.; GERLOFF, G. C. Stem streak necrosis of potatoes in relation to soil acidity. *Amer. Potato J.* 24, 1947 (156-162). R.A.M. 27 (40).

Severe stem-streak necrosis developed where soil had been treated with sulphates and chlorides, but not where it had been limed. It was found frequently where soils were more acid than pH 5.1, but the disorder was not due to pH, soluble Al or deficiency of Ca or Mg. A similar streak necrosis developed when plants were grown in solutions containing 100-200 p.p.m. of soluble Mn and it is concluded that the disease is caused by excess of soluble Mn in acid soils.

[631]

633.491-2.4-1.82

SANFORD, G. B. Effect of various soil supplements on the virulence and persistence of *Rhizoctonia solani*. *Sci. Agric.* 27, 1947 (533-544). [Dom. Lab. of Plant Path. Edmonton, Alberta]

The effect of 18 soil supplements on the virulence and persistence of *Rhizoctonia solani* in fertile, black virgin soil, artificially infested, was observed during 6-8 successive

21-day replantings in 6 experiments. N salts and cornmeal reduced the disease and the persistence of the pathogen; sucrose, $\text{Ca}(\text{OH})_2$, MgSO_4 and S were uniformly favourable, sucrose being the most favourable to both the disease and the persistence of the pathogen. The effect of dextrose was variable. The reduction of the disease and the apparent decline of the pathogen in the soil are attributed to antibiotic effects from the associated soil fungi and bacteria and not to any lack of available nutrients or to unfavourable soil temperature, water content or pH.

[632] 633.491-2.8-1.4
STÖRMER, K.; BERNUTH, I. VON. Zur Bekämpfung der virösen Abbaukrankheiten der Kartoffel. [Contribution to the struggle against potato-virus diseases.] *Biol. Zentralanst. Land- und Forstwirts. Festschr. Otto Appel.* 1947 (27-29). [G.] [Expt. Sta., Blickwedel (Hann).]

Seed selected from apparently healthy and productive plants (a) from a typical potato soil at an altitude of 60 m., (b) from a heavy soil at an altitude of 280 m. were planted in mid-April in an area subject to leaf-roll disease. The plants resulting from (a) were 80% affected by leaf-roll, whereas of those from (b), 4% were affected. Soil, fertilizers and ecological influences in general are secondary and unessential factors in determining the incidence of virus disease.

633.51 COTTON

(See also Abs. No. 708)

[633] 633.51-1.582
CAMERON, G. S. Bulletin for cotton growers. *Rhod. Agric. J.* 44, 1947 (498-501).

The present rotation is maize, sunn hemp (ploughed in), maize, cotton (with farm-made compost applied at 5 tons/acre), maize. On poor light sandy soils and sand veld, only one maize crop should follow cotton. In Southern Rhodesia cotton does not respond to artificial fertilizers, but there is immediate response to compost. The importance of cotton in the rotation is becoming better recognized, especially in years of low and scanty rainfall, as the type grown can withstand drought better than most crops.

[634] 633.51-2.4-1.81
SOLOVEVA, A. I.; POLYARKOVA, L. V. [Wilt of cotton]. *Tashkent Agric. Pub. Dept. Uzbekistan* 1940, pp. 63. R.A.M. 27 (19).

Verticillium dahliae does not become inactive in the soil at temperatures of -30° and 80°C . Growth occurred at $7-32^\circ$ at 20% soil humidity, and increased moisture stimulated growth. Rotation with lucerne and application of fertilizers greatly reduced the wilt. Dung had no effect on resistant varieties, and slightly increased wilt on non-resistant ones.

633.6 SUGAR CROPS

(See also Abs. No. 742)

[635] 633.63-1.582
GILL, J. G. Influence of crop-sequence and fertilizers on the sugar beet crop. *Proc. Amer. Soc. Sug. Beet Tech.* 4, 1946 (54-63). Sugar 42, No. 11, 1947 (52). [U.S.D.A.]

Maize and soybeans grown for seed created more favourable soil conditions for sugar beet than when the crop was preceded by sugar beet or oats.

[636] 633.63-1.81
GARDNER, R.; ROBERTSON, D. W. Comparison of the effects of manures and commercial fertilizers. *Proc. Amer. Soc. Sug. Beet Tech.* 4, 1946 (27-32). Sugar 42, No. 11, 1947 (51).

On a soil deficient in N and P, P gave an increase of 3.5 tons/acre and N an increase of 7 tons/acre of sugar beet. Manure and commercial fertilizer were equally effective, using the same amounts of N and P. Artificial manure was prepared by adding $(\text{NH}_4)_2\text{SO}_4$ and treble super. to straw and allowing the straw to rot. When fresh straw with the same amount of N and P was ploughed under it gave much better results than mineral artificial fertilizer.

[637] 633.63-1.81: 581.192
HILL, K. W. Yields, sucrose percentage, and apparent purity of beets as affected by cultural practices in Alberta. *Proc. Amer. Soc. Sug. Beet Tech.* 4, 1946 (63-72). Sugar 42, No. 11, 1947 (52). [Dom. Expt. Sta., Lethbridge, Alberta]

On fields deficient in P, manure increased yield without decreasing the percentage of sucrose. P alone increased yields, but not as much as when used with manure.

[638] 633.63-1.85:546.185-35
JONES, B. A.; GREEN, G. **Liquid phosphoric acid as a fertilizer.** *Proc. Amer. Soc. Sug. Beet Tech.* 4, 1946 (36-39). *Sugar* 42, No. 11, 1947 (52).

Good results were obtained with sugar beet when liquid P_2O_5 was added to irrigation water at the rate of 100-200 lb./acre. Germination was improved. Since the P_2O_5 is dispersed throughout the soil by the water, there is no danger of 'burning' the plants. The effect of one application lasts for 2-4 years.

[639] 633.63-1.859.1
SWIFT, E. G. **Side-dressing sugar beets with nitrogen in Montana.** *Proc. Amer. Soc. Sug. Beet Tech.* 4, 1946 (40-41). *Sugar* 42, No. 11, 1947 (52).

In this region where applications of treble super. alone are usual, 20-67 lb./acre of N as ammonium phosphate as a side dressing has improved yields.

[640] 633.63-2.4-1.81
AFANASIEV, M. M.; MORRIS, H. E. **Effect of different soil and seed treatments on the control of seedling diseases of sugar beets under controlled conditions.** *Proc. Amer. Soc. Sug. Beet Tech.* 1946, 1947 (331-340). *R.A.M.* 27 (1).

Complete fertilizer produces vigorous fast-growing seedlings, only slightly diseased, and is more effective than chemical seed treatments in controlling beet root rots. When a soil is well fertilized there is no benefit from treating seeds with treble super. or $NaNO_3$.

[641] 633.63-2.4-2.953
DOYLE, R. J. **Controlling sugar beet blackrot.** *Sugar* 42, No. 11, 1947 (36-37).

When 3 lb./acre of the fungicide tetramethyl thiuramdisulphide or "Arasan" was applied to infected soil before planting, sugar-beet seedlings emerged hardy and fast-growing with no sign of root rot. Larger doses were toxic.

633.7 STIMULANTS

(See also Abs. No. 710)

[642] 633.71:633.51-2.2
CAMERON, G. S. **Cotton as a trap crop for eelworm.** *Rhod. Agric. J.* 44, 1947 (502).

Eelworm infestation in tobacco soils is much reduced when tobacco follows cotton in the rotation, as cotton rootlets are intolerant to eelworm galling.

[643] 633.71-1.531
BROWN, D. D. **Tobacco culture in Southern Rhodesia. Seed-beds.** *Rhod. Agric. J.* 44, 1947 (509-519).

Land should be used for seed beds only once in every 4-5 years and crop rotation should be practised. The seed bed should be sterilized, compost added, and fertilizer containing 1 lb. of super., $\frac{1}{2}$ lb. of $NaNO_3$ and $\frac{1}{2}$ lb. of K_2SO_4 should be broadcast at the rate of 2 lb. per 10 sq. yards. The bed should be dug to a depth of 3 inches to mix the ash, compost and fertilizer with the surface soil.

[644] 633.71-2.2
VALLEAU, W. D.; JOHNSON, E. M. **The relation of meadow nematodes to brown root-rot of tobacco.** *Phytopath.* 37, 1947 (838-841). [Ky. Agric. Expt. Sta., Lexington]

Meadow nematodes are abundant in roots of tobacco plants affected by brown root-rot, and there is good evidence that the nematodes cause extensive injury to the roots of tobacco and other crops.

[645] 633.71-2.3-2.953
SMITH, T. E. **D-D mixture as a soil treatment for bacterial wilt on tobacco.** *Phytopath.* 37, 1947 (371). [U.S.D.A. and N.C. Agric. Expt. Sta.]

Commercial D-D mixture was applied at rates of 2, 4 and 8 ml./square foot of soil surface to plots 12 x 24 feet with watertight sidewalls. Wilt (*Bacterium solanacearum* E. F. Smith) was reduced from 82% to 59, 24 and 0% in one season. The same plots planted with susceptible tobacco without further treatment showed 71, 73 and 11% as against 83% in the control. Residual protection persisted into the second successive tobacco crop and was greater than that

noted on soil treated with chloropicrin and urea or on plots rotated with maize and other crops.

633.8 MEDICINAL AND OIL CROPS

[646] 633.812.75-1.828
CIFERRI, R. Experiments of oligodynamic fertilization of *Leonurus cardiaca* L. *Riv. Ital. Essenze* 29, 1947 (190-191). C.A. 41 (7612).

The fertilizer used, "Fersin," contained salts of Mn, Zn, Fe, Mg, K, Cu, B and Mo. With Fersin alone the yield was 301%, with Fersin together with K, N and P fertilizers it was 186-284% in rich soils and 101-201% in poor soils, and with Fersin and stable manure it was 252% of the control.

[647] 633.854.78-1.582
TIMSON, S. D. The sunflower (*Helianthus annuus*). *Rhod. Agric. J.* 44, 1947 (532-545).

Sunflower is a useful crop used in rotation with mixed farming, especially in districts of light rainfall. In rotation with maize it is less exhausting than buckwheat or linseed, especially if after harvesting the refuse is burnt and the ash broadcast and ploughed under. The rotation used in Southern Rhodesia is green manure, maize (+ 200 lb./acre of super.), groundnuts and sunflower, maize (+ 200 lb./acre of rock phosphate). The average yield of the second maize crop for 14 years was 10.65 bags/acre after groundnuts, and 10.17 bags after sunflowers. In experiments on the effect of 6 crops on the following groundnut crop, yields of groundnuts were: after sunflowers 120.7, oats 113.4, sunnhemp (grain) 112.3, maize 109.4, velvet bean 108.2 and sunnhemp (ploughed under) 100. Sunflowers are a valuable green-manure and weed-smothering crop. They may be grown successfully on soils too poor for a good maize crop and on old maize lands.

[648] 633.888.43-1.816.2 : 581.192
PRASAD, S. Influence of time of application of fertilizers on growth and alkaloidal content of *Hyoscyamus niger* L. *J. Amer. Pharm. Assoc.* 36, 1947 (180-184). C.A. 41 (7612).

Plants receiving N from the very beginning of the life cycle show decidedly greater growth of leaves and branches and are sturdier than those receiving N at later stages. Fractionation of the complete normal dose into three does not produce as good effects as fractionation into two, applied at the beginning and middle of the period of active growth. Greatest alkaloid formation is obtained by application of half the dose of complete fertilizer at the beginning and half in the middle of the active growth period. The critical application period for N is 40 days and for P and K is 70 days after germination, at which periods an adequate supply is most helpful to growth and alkaloid formation.

633.912 RUBBER

[649] 633.912-1.81
WHELAN, L. A. The manuring of young rubber. *Rubber Res. Scheme (Ceylon) Quart. Circ.* 24, Pts. 1 and 2, 1947 (28-35).

Manuring experiments on young rubber trees during the past 8 years are reviewed. The application of rock phosphate is recommended in amounts increasing with the age of the trees up to 5 years. After the first 5 years, manuring is not usually necessary. On badly eroded soils or where the growth of rubber is poor, N and K should be added. Compost and cow manure give better results on shallow soil. Proprietary organic manures are valuable in nurseries and in planting holes.

[650] 633.912-2.4-2.953
DEPOERK, R. Sur un nouveau procédé de lutte contre les pourridies en hévéa-culture. [On a new method for the control of root rots of *Hevea*.] *Bull. Inst. Colon. Belge* 17, 1946 (980-986). R.A.M. 26 (466). [Fr.]

Powdered CuSO₄ crystals at the rate of 100 gm. per tree were ground up with 3 times their weight of soil and the mixture sprinkled on an area excavated around the tree roots. Rain acted as a diluent and with percolation the solution formed created a sterile cylinder of soil around the tap root.

634 ORCHARDS. FRUIT

(See also Abs. Nos. 530, 588, 596)

[651] 634.II-1.81
WILCOX, J. C. ; HOY, B. ; PALMER, R. C. **Orchard fertilizer tests in the Okanagan Valley.** *Sci. Agric.* 27, 1947 (116-129). [Dominion Expt. Sta., Summerland, B.C.]

Fertilizer experiments have been carried out on brown earths in a semi-arid region where little leaching of P and K occurred. Except where leguminous cover crops were grown there was a marked response to N as shown by increased vigour and yield. P and K were without effect, although analyses of leaves and twigs showed that more P and K were absorbed by trees on plots provided with these elements than by the controls. $(\text{NH}_4)_2\text{SO}_4$ and 16-20-0 lowered the pH in the top 8 inches of soil, but did not affect the subsoil.

[652] 634.II-1.811.I
MAGNESS, J. R. ; BATJER, L. P. ; REGEIMBAL, L. O. **Apple-tree response to nitrogen applied at different seasons.** *J. Agric. Res.* 76, 1948 (1-25).

Different seasons of N application over a period of 4 years failed to influence materially the N level of mature apple trees. It is concluded that, if the level of N metabolism is satisfactorily maintained within the tree, it makes little or no difference, at what season of the year the soil supply is replenished. With young trees, however, late-spring and mid-summer applications of nitrate N resulted in a higher N level in the foliage, which was associated with greater growth and in certain varieties with less colour.

[653] 634.II-2.4-2.953
GROVES, A. B. **Chemical treatment of the soil for control of black root rot of apples.** *Va. Fruit* 35, 1947 (54-56). *Biol. Abs.* 21 (1792). [Va. Agric. Expt. Sta.]

Treatments with Bordeaux mixture, CS_2 and Uramon give promising results in the control of black root rot (*Xylaria mali*) in apple trees. 6-10 gallons of a 6-6-100 Bordeaux mixture or 6 oz. of Uramon per cu. foot of soil are incorporated with the soil as the hole is refilled when the tree is planted. CS_2 , which is the most promising

treatment, is applied by marking off an area 4 feet square into 6-7 squares and injecting 2 oz. of CS_2 into each intersecting mark.

[654] 634.II-2.19-1.416.I
GUYON, G. **Diagnostic de carence azotée du pommier par l'analyse de la feuille. Vérification expérimentale. [Diagnosis of nitrogen deficiency in the apple tree by analysis of the leaf. Experimental verification.]** *C.R.* 225, 1947 (1174-1175). [F.]

In apple trees in grass orchards, a progressive enfeeblement, associated with the presence of few, small and light green leaves, failure to develop new twigs, superficial reddening of twigs on the side exposed to the sun and the production of few and small apples, was due to N deficiency caused by the presence of the grass. In August, the leaf N should form about 2.3% of the dry leaf weight; diseased leaves contained about 1.5%. Treatment with 150-250 kg./ha. per year of N in 3 applications cured the disease in 2 years, and injection of a solution of 0.5% NH_4NO_3 into the trunk in early spring cured the tree in the same year.

[655] 634.25-1.84 : 577.16
WITTWER, S. H. ; HIBBARD, A. D. **Vitamin C-nitrogen relations in peaches as influenced by fertilizer treatment.** *Proc. Amer. Soc. Hort. Sci.* 49, 1947 (116-120). [Univ. Miss.]

Readily available N fertilizers applied in June had a markedly depressing effect on the concentration of vitamin C in the fruit. A heavy application of $(\text{NH}_4)_2\text{SO}_4$ in early spring had a similar effect. The effects of calcium cyanamide and Uramon varied with the season, giving low yields generally but fruit high in ascorbic acid. A complete fertilizer slightly reduced the ascorbic acid in the fruit but gave the highest yields of any treatment.

[656] 634.3-1.5
MONSELISE, S. P. **The growth of citrus roots and shoots under different cultural conditions.** *Palestine J. Bot. (R)* 6, 1947 (43-54).

The application of manure increased shoot growth, but had less influence on root growth. Soil temperature during the cool, moist

season and soil moisture during the hot, dry season were the main factors influencing root growth. Limiting soil temperatures were 13-14°C. and minimum moistures corresponded to soil-suction forces of 7.5-8.0 atmospheres.

[657] 634-58-1.414-1.416.7: 581.192
MEHLICH, A. ; REED, J. F. **The influence of type of colloid and degree of calcium saturation on fruit characteristics of peanuts.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (201-205).

Peanuts were grown in Norfolk sand in outdoor frames, and the fruits were produced in trays containing mixtures of sand with colloids of kaolinitic, montmorillonitic and organic (muck) types. The mixtures provided variations in cation-absorption capacity, Ca level and Ca-saturation value. With a kaolinitic-type colloid, a high percentage of filled fruits was obtained at levels of Ca as low as 0.39 m.e., the percentage becoming materially reduced only at a Ca level of 0.15 m.e. At any given Ca level the montmorillonite and organic systems produced fruit of much lower quality, while at low Ca levels the addition of muck to a kaolin medium strikingly reduced the quality. At any given cation-absorption capacity the quality (degree of fill) increased with increasing Ca-saturation, and at a given Ca-saturation level, the higher Ca levels produced the better fruit.

For any given Ca level in the medium, the Ca content of the shells was highest in fruit produced in the kaolinitic colloid, whereas the Ca content of the tops was highest when the root was grown in the organic-type colloid.

[658] 634.61-2.7
OTOYA, F. J. **El cucarron o escarabajo que ataca las palmas de coco en la zona del Caribe. [The beetle attacking coconut palms in the Caribbean area.]** *Agricultura, Bogotá* 16, 1944 (1215-1219). [Sp.]

The elliptical pearly white eggs are laid in holes 2 cm. wide and 10 cm. deep in the base of the trunk and the larvae consume the underground parts of the tree. Control is effected by the use of organic-matter traps consisting of holes 30 cm. deep and 2 square metres in area, filled with layers of dung and palm residues and covered with palm leaves ;

the traps are distributed over the plantation, and every 2 months a litre of CS₂ is uniformly distributed over each. Each affected tree should be treated with 50 gm. of para-dichlorobenzene applied in a shallow circular trench at 30 cm. from the trunk ; or 50 cc. of CS₂ in shallow holes at 50 cm. distance. Trees less than 5 years old should receive 6 gm. or 10 cc. respectively for each year of age.

[659] 634-1.4
OVERHOLSER, E. L. **The soil and the fruit tree.** *Va. Fruit* 35, 1947 (63-75). *Biol. Abs.* 21 (1769).

Selection and constitution of a good orchard soil is discussed in relation to absorption of soil solution, soil drainage, tree tolerance of poor drainage, soil-moisture relationship, soil depth, soil reaction, soil fertility, availability of nutrients, organic matter and cover crops.

[660] 634-1.421
MCHATTION, T. H. **The comparison of plot size in a peach experiment.** *Proc. Amer. Soc. Hort. Sci.* 49, 1947 (18-20). [Univ. Georgia]

Plots of from six to eight plants should produce trustworthy data on which to base general orchard recommendations.

[661] 634-2.19
MULDER, D. **Overmaat en tekort aan voedingsstoffen als oorzaken van ziektenverschijnselen bij vruchtbomen. [Excess and deficiency of nutrients as the cause of disease in fruit trees.]** *Tuinbouw* 2, 1947 (305-309). [Du.]

Deficiency diseases are due more often to unsuitable proportions of nutrient elements in the soil than to actual lack of them. For example, the application of lime to a Ca-deficient soil raises its fertility by liberating other nutrients held in the soil complex, but excess of Ca may result in deficiency of B, Fe or Mn by rendering these elements insoluble. K increases the uptake of Fe and Mn, but promotes Mg deficiency by introducing a competitive factor into the uptake of nutrients by the roots. Phosphate ions form insoluble compounds with Fe, Zn and Cu and, in P-rich soil, cause a deficiency of Zn. In orchards these deficiencies are indicated by the condition of the leaves, but the appear-

ance of the symptoms is affected by the vigour, species and variety of the tree. The symptoms may be confused with those due to sprays or drought when very small amounts of nutrients are transported by the sap to the leaves. The differences between deficiency-symptoms and other leaf discolourings are discussed and it is concluded that the nutrient status of the soil can be determined by parallel chemical investigations of the leaf and soil.

[662] 634.653-2:546.331.31
BATISTA, A. CHAVES. "Tipburn" do abacateiro em Pernambuco. ["Tipburn" of the avocado in Pernambuco.] *Bol. Sec. Agric. Pernambuco* 13, 1946 (136-140). *Biol. Abs.* 21 (1791).

A confirmation of N. American researches on "tipburn" caused by an excessive accumulation of NaCl in poorly drained soils.

[663] 634.73-1.544.7
CHRISTOPHER, E. P.; SHUTAK, V. **Influence of several soil management practices upon the yield of cultivated blueberries.** *Proc. Amer. Soc. Hort. Sci.* 49, 1947 (211-212).

A comparison of clean culture with a cover crop of buckwheat, a mulch of straw and hay, a mulch of sawdust and of clean culture alone showed that the mulch of sawdust was superior to the other soil-management systems.

[664] 634.73-1.544.7
GRIGGS, W. H.; ROLLINS, H. A. **The effect of planting treatment and soil management system on the production of cultivated blueberries.** *Proc. Amer. Soc. Hort. Sci.* 49, 1947 (213-218).

In a comparison of clean cultivation, sawdust mulch and hay mulch, sawdust mulch gave greater yields than either of the other treatments, and facilitated weed control. After five years the soil under hay mulch had the highest content of organic matter and the greatest moisture retentiveness.

[665] 634.75-2.954:577.17
AGRICULTURAL CHEMICALS. **2,4-D on strawberries.** *Agric. Chem.* 2, No. 12, 1947 (47).

Spray at half strength eliminated small weeds from strawberry beds. First-year beds may be sprayed at any time, but fruiting beds only after harvest.

[666] 634.774-1.81:577.16
HAMNER, K. C.; NIGHTINGALE, G. T. **Ascorbic acid content of pine-apples as correlated with environmental factors and plant composition.** *Food Res.* 11, 1946 (535-541). *Biol. Abs.* 21 (1771). [U.S. Plant, Soil and Nutrition Lab., Ithaca]

The ascorbic-acid content of pineapples was found to be unaffected by variation in fertilizer practice, but was correlated with air temperature during the 6 weeks before harvest and was increased by shading.

[667] 634.777-1.5
CHOWDHURY, S. **Pineapple culture in Assam.** *Indian Farm.* 8, 1947 (187-190).

The time of planting is largely governed by suitable weather, the most important time in the life of a plantation being the first few months after planting. Weed control appears to be the first consideration in deciding on a system of cultivation. In practice no systematic manuring policy is followed, but continuous good cropping is not possible without fertilizing. The first fertilizer should be applied shortly after planting, so as to encourage as quickly as possible a wide-spreading leaf growth. At the time of planting, decomposed cow dung and oilcake may be applied at the rate of 5-10 tons per acre and a 10-6-10 fertilizer mixture used for later applications. The fertilizer mixture is best applied in the form of a water-soluble mixture placed at the base of the leaves.

[668] 634.8-1.427.3
MAUME, L.; DULAC, J. **Sur les valeurs extrêmes des proportions d'azote, d'acide phosphorique et de potasse dans la feuille, en relation avec la santé de la vigne. [The maximum and minimum quantities of nitrogen, phosphoric acid and potash in the leaf, in relation to the health of the vine.]** *C.R.* 225, 1947 (1374-1376). [F.]

In vine leaves from the bases of fruiting shoots, the quantities of plant nutrients (expressed as percentages of dry weight) varied greatly even in leaves at the same stage of development, the extremes being

0.70 and 3.9 for N; 0.12 and 1.4 for P_2O_5 ; 0.2 and 4.1 for K_2O . The minima for any one or for the sum of all 3 nutrients were usually found in neglected, badly managed, old or diseased vines, and low figures for K were more common than for N or P.

634.9 FORESTRY

[669] 634.9-1.4:581.5
DUCHAUFOR, PH. Le sol et la flora forestière en quelques points des secteurs parisien et ligérien. [Soil and vegetation in parts of the Paris and Loire regions.] *Rev. Eaux et Forêts* 84, 1946 (701-722); 85, 1947 (16-38). *Biol. Abs.* 21 (1596).

Typical soil profiles and the accompanying vegetation are described. The soils are compact clays, silts or sandy loams, siliceous or gravelly loams, sands and limestone soils. On soils of the gravelly loam and sand series which are fairly permeable, ericaceous heaths on podzols form a stable paraclimax, which corresponds to humid *Molinia* heath and sphagnum bogs on the compact clays.

[670] 634.9-1.452
TAMM, O. Skogsproduktionens naturliga förutsättningar i Sverige. [Natural conditions of forest production in Sweden.] *Kgl. Lantbr.Akad. Tidskr.* 86, 1947 (261-271). [Sw.f.]

Swedish silviculture is characterized by the use of very few species. Norway spruce, Scots pine and birch are the three main species which are singularly suitable for existing soil and climatic conditions. The more important factors of high silvicultural productivity are climatic and pedological, e.g., temperature, radiation and precipitation, mineralogical composition of the soil and the dynamic conditions of the humus layer. The productivity is more sensitive to temperature as a limiting factor than in certain agricultural crops. The forest types exert profound influence on the soil conditions chiefly through the humus layer. The condition of the humus, whether in active or inactive form, is a function of several factors and may be varied by cultivation measures such as choice of species, spacing and alterations in drainage conditions. All measures in forestry aim to simulate the natural

processes to maintain the natural conditions for fertility rather than to produce radical changes of short duration in the soil conditions.

More evidence is needed before it is possible to judge the value and practicability of using fertilizers on forest soils to increase the productivity which must be maintained over much longer periods than when the land is under agricultural crops.—S.H.

[671] 634.956.4-2.51-2.954
ROBBINS, P. W.; GRIGSBY, B. H.; CHURCHILL, B. R. Report on chemical weed control for conifer seedlings and transplants. *Mich. Agric. Expt. Sta. Quart. Bull.* 30, 1947 (237-240).

A 2% solution of H_2SO_4 , 5% solution of P_2O_5 , Dow Selective Weedkiller, 2,4-D and Stanisol were used in a series of weed-control plots of conifers. Stanisol (a petroleum product of the naphtha series containing approximately 10% of aromatic compounds) was the only chemical that controlled weeds and did not harm the conifers if applied while the seed coats were still on the cotyledons or after the trees were one year old.

[672] 634.975-1.44
DAY, W. R. Soil selection and forestry. *Farming* 2, 1948 (18-23).

An estimate of the rate of growth of trees as shown by growth curves is a valuable indication of the productive capacity of land for forestry. Diagrams showing height-increment age curves reflect the effect of changes in soil or climatic conditions. Curves for Sitka spruce are of two types, those which rise quickly and fall quickly and those which rise less quickly and show continued growth at a relatively high rate for a long period. The former refer to trees grown on shallow soils where impeded drainage restricts root development. The latter refer to trees grown on alluvial soils of moderate depth with a permanent and relatively constant water table.

Curves for Scots pine refer to trees grown on light freely draining sand 2-3 feet deep, underlain by compacted sand within the rooting profile. There is little accumulation of raw humus. The curves show rapid early growth and early fall in the growth rate. Tree roots may suffer injury from drought or waterlogging. Growth curves for Sitka

spruce growing on brown earth with sometimes free but often impeded drainage in the subsoil show slow early growth. There is a correlation between soil depth and height growth.

The rate of production of timber on much of the hill land of Britain with shallow poor soil must be low. Much of the land at present under forest is essentially of the relatively-short-rotation type.

635 HORTICULTURE

[673] 635 : 557.16 : 546.74
LOO, T. Y. ; CHEN, S. M. **Improvement of the vitamin content of vegetables.** *J. Agric. Assoc. China*, Suppl. No. 50, 1945 (20).

Addition of very small amounts (about 2 oz. per mou) of nickel or zinc compounds to soil increases the vitamin contents of pepper, tomatoes and peas. Average increase of vitamin A is 20% and of vitamin P, 30%.

[674] 635.31-1.81
CLORE, W. J. ; STANBERRY, C. O. **Further results of asparagus fertilizer studies in irrigated Central Washington.** *Proc. Amer. Soc. Hort. Sci.* 49, 1947 (296-298).

Average yields from plots receiving N and P in combination were greater than those from plots receiving only N. Substantial increases were not obtained the year the beds were manured. Yield increases could be expected the year after manuring with N alone and with N and P in combination.

[675] 635.34-2.4-2.953
DORAN, W. L. **Fungicides applied in fertilizer for the control of cabbage clubroot and damping-off.** *Abs. in Phytopath.* 37, 1947 (848).

Fungicides mixed with 5:8:7 fertilizer and applied to the soil at the rate of 15.6 gm. of fertilizer per square foot immediately before seeding controlled damping-off better and with less injury than when applied in water immediately after seeding. Mercury salts controlled clubroot better and more safely in soils that had previously received hydrated lime or NaCl than they did in untreated soils. Dithane was more effective against damping-off in a limed soil.

[676] 635.52-1.411.4-1.81
RALEIGH, G. J. ; KUNKEL, R. ; HARRINGTON, J. F., ET AL. **Fertilizing 456 lettuce on muck soils.** *Proc. Amer. Soc. Hort. Sci.* 49, 1947 (275-276). [Cornell Univ.]

Adequate N was especially important for early plantings, but is also suggested for all spring seedings because it may hasten maturity and thus possibly reduce losses from aster yellows.

[677] 635.61-1.816.2
RAHN, E. M. **Yields of cantaloupes as affected by time of placement of manures in furrows.** *Proc. Amer. Soc. Hort. Sci.* 49, 1947 (277-280). [Univ. Del.]

The greatest total and early marketable yields resulted from manure placement in furrow a month before seeding, while the greatest yields of melons 5 inches or more in diameter resulted when the time interval was one week.

[678] 635.52-1.816.3
GRIFFITHS, A. E. ; FINCH, A. H. **Further studies on the response of lettuce to fertilization.** *Ariz. Agric. Expt. Sta. Bull.* 199, 1945 (1-42). *Biol. Abs.* 21 (1773).

Band placement of fertilizers 3 inches below the seed and 1.5 inches to the furrow side resulted in larger heads and greater yields of lettuce than the same amounts broadcast except when N was applied at time of planting to fertile soils of high organic-matter content. On such soils P applied at planting and N later as a side dressing gave best results. On soil low in organic matter, band placement of mixtures containing blood meal or goat manure or 10 tons of corral manure gave better crops than chemicals alone. Leguminous green manures were also helpful.

[679] 635.611-2.4-1.811
STODDARD, D. L. **Nitrogen, potassium and calcium in relation to Fusarium wilt of muskmelon.** *Phytopath.* 37, 1947 (875-884).

High levels of N encouraged invasion by the fungus. K supply did not appear to affect the total growth of *Fusarium bulbigenum* var. *niveum* f.2. Addition of lime in sufficient quantities to raise the soil pH to 6.0 reduced the amount of disease in field plots.

[680] 635-1.81:581.192
CHEN, C. Y. **Fertilizers and the utilizable proteins in vegetables.** *J. Agric. Assoc. China* Suppl. No. 50, 1945 (21).

The percentages of the utilizable protein in the crude-protein fractions of vegetables receiving different fertilizer treatments were as follows:

Fertilizer	Head cabbage	Chinese cabbage
No fertilizers	100%	58%
Chemical fertilizers, normal	82	63
" " excess	—	81
Human excreta, normal	54	99
" " excess	—	75
Chemical fertilizers + excreta	60	—

[681] 635-1.811.4
WITTWER, S. H.; ALBRECHT, W. A.; SCHROEDER, R. A. **Vegetable crops in relation to soil fertility. V. Calcium contents of green leafy vegetables.** *Food Res.* 12, 1947 (405-413). [Missouri Agric. Expt. Sta.]

Spinach, Swiss chard, beet, New Zealand spinach, mustard, turnips and kale were grown in clay cultures supplied with 5, 10, 20 and 40 m.e. of Ca and N separately and in all possible combinations. Analysis of the tops at maturity showed that response to N was greater than to Ca, especially with New Zealand spinach and kale. Increase in the Ca contents of the plant tissues with increase in Ca supply was much more marked in the cruciferous vegetables than in those of the Chenopodiaceae although there was little change in vegetative growth with additional supplies of Ca. The oxalate content, which was affected by varying the level of soil N but not of soil Ca, exceeded by many times the Ca present in the Chenopodiaceae, but was almost nil in the Cruciferae.

[682] 635.64-2.954:577.17
ATKINSON, J. D. **Tomatoes injured by hormone weedkillers. Other cultivated plants susceptible.** *N.Z. J. Agric.* 75, 1947 (349-351).

When used in pasture country there is little risk of injury from hormone weedkillers, but in cultivated areas great care must be taken to see that neither spray drift nor vapour reaches susceptible plants, which

include not only tomatoes but also other vegetables such as *Brassicæ*, flowering plants and shrubs and grape vines, malformation in grape leaves being caused by the spray.

[683] 635.65-1.5
NOONAN, J. L. **Production of field beans in New England. A profitable leguminous rotation crop.** *Agric. Gaz. N.S.W.* 58, 1947 (575-577).

In the New England (or Northern Tableland) districts of New South Wales field beans fit very well into the farm rotations with maize, oats, potatoes and vegetables and are extremely valuable in maintaining soil fertility. Consumption of field beans has risen considerably in Australia, 3,000 tons being now necessary to satisfy requirements, though in the best crop year only 1,500 tons have been produced.

Among the optimum climatic conditions is a frost-free period of about 120 days. In New England granitic soils and red loams are the most suitable, heavy basaltic soils being unsuitable because of the rank growth they produce. Super. at the rate of $\frac{1}{2}$ to 1 cwt. per acre should be used on most soils, with the higher rate on granitic soils. A light harrowing is advisable two to three days after sowing and a further harrowing should be done as soon as the plants are well established.

[684] 635.65-1.811.9:577.16
LOO, T. Y.; CHEN, S. M. **Effect of some mineral elements on the vitamin-C content of bean sprouts.** *J. Agric. Assoc. China*, Suppl. No. 50, 1945 (21).

Beans were germinated in the presence of 46 inorganic salts representing 23 elements. Uranium, magnesium, and zinc enhanced the content and the physiological activity of vitamin C in the sprouts.

[685] 635.65-2.4-2.953
LEACH, L. D.; SNYDER, W. C. **Localized chemical applications to the soil and their effects upon root rots of beans and peas.** *Abs. in Phytopath.* 37, 1947 (363).

25% Dithane D14 was the most effective of the chemicals used in the row when seeding. When applied at the rate of 1 gallon, or 2 lb. of dry powder (Dithane A10), per acre a marked reduction in the incidence of root rot was obtained.

GEOGRAPHICAL

(See also Abs. Nos. 410, 494, 495, 502, 506, 584, 595, 612, 617, 620, 633, 643, 670)

[686] (41)632.19
PLANT, W. **Survey of mineral deficiencies on tillage land.** *Nature*, 160, 1947 (336). [Long Ashton Res. Sta.]

Two seasonal surveys using visual diagnosis tests and tissue tests for determining the nutrient condition of crops were carried out in Hereford in 1945 and in Somerset in 1946. In each survey a random sample of farms was taken, representing 2% of all holdings of 10 acres or more. N deficiency occurred in most crops in 18% of the acreage in Somerset and in 10% in Hereford. P deficiency (19 and 20% respectively) was prevalent in cereals; K deficiency (1% in both counties) was confined mainly to potatoes, but affected some mangolds; Ca deficiency was found only in roots in Hereford and was negligible. B was the only trace element lacking, and sugar beet and mangolds in Hereford only were deficient.

It is suggested that a more rational use of fertilizers would involve increased use of N for all crops, of P for cereals and of K for potatoes. Lime should be used only where soil tests show definite need, and over-liming should be avoided as it induces B deficiency in some soils.

[687] (426)631.411.4 : 631.61
MCMILLAN, J. A. **Reclamation work in the fens.** *Agric. Prog.* 22, 1947 (39-42).

During the war a fine disc plough known as the stump jumper was used for the first cultivation of neglected fenland in England. Most of the lighter land reclaimed was low in available P and K. Fertilizer was used on a potato crop which was followed by wheat. On the lighter fens strip farming has been ineffective in counteracting blowing, and experiments are in progress to test the value of clayey these light soils. Mn deficiency has been rectified by adding $\frac{1}{2}$ cwt./acre of $MnSO_4$ to the first application of fertilizer.

A survey of soils and sub-soils is recommended. It may be desirable to allow certain areas to revert to natural vegetation and to induce new peat to accumulate rapidly on

such areas so that they might become available quickly for cultivation of arable crops.

[688] (436)631.459
GLOVER, H. **Erosion and flood control in Austria.** *Indian Forester* 73, 1947 (70-73).

Austria suffered much from floods caused by deforestation in the 18th and early 19th centuries, but subsequently evolved types of farming and forest management that made serious flooding exceptional. Reliance is placed more on biological than on engineering methods of control. Since the war there has been great pressure to plough up grassland and to fell forests.

[689] (439)631.4
BALLENEGGER, R. [Survey of soils of Tihany Peninsula.] *Magyar Biol. Kutatóintézet Munkái* 14, 1942 (1-4). C.A. 41 (7600).

Present climatic conditions are favourable to the formation of a steppe type of soil, and such soils are predominant. Meadow soils of previously humid areas have changed to steppe soils.

[690] (44)633.18-1.3
BALLU, T. **La mécanisation de la culture du riz en Camargue.** [The mechanization of rice cultivation in Camargue.] *C.R. Acad. Agric.* 33, 1947 (709-711). [F.]

About 2000 ha. of this largely uncultivated region of the Rhône delta is under rice and producing up to 40 quintals/ha. About 20,000 ha. are capable of growing rice in rotation with wheat and other crops. The crop is harvested by sickle, partly because the ground is kept flooded until a fortnight before harvesting and is too soft to support heavy machinery, and partly because the varieties grown tend to lodge. A new design of combine harvester would be required with a very light body and very large low-pressure rubber tyres. The use of ox-drawn reapers appears to be the only advance immediately practicable.

[691] (45)631.415.1
PRINCIPI, P. [Some acid soils of Pratomagno, Arezzo Province.] *Ital. Forest. Monti.* 2, 1947 (140-141). C.A. 41 (7600). [I.]

[692] (46)631.4
HOYOS DE CASTRO, A. Contribución al estudio de los suelos silíceos españoles. [Contribution to the study of Spanish siliceous soils.] *An. Inst. Esp. Edafol.* 6, 1947 (309-323). [Sp.e.]

Mechanical and chemical analyses of 3 soils from the village of Piedrahita in Avila showed them to be medium brown soils, slightly podzolized, and unsaturated, due to the scarcity of bases in the parent rock. The soils with a heavier plant cover were the more dispersed.

[693] (46)631.416
LOPEZ DE AZCONA, J. M.; GUEL BENZU, M. D.; RUIZ, A. S. [Elements contained in Spanish clays.] *Bol. Inst. Geol. Min. España* 58, 1945 (437-473). C.A. 41 (7321).

A qualitative and semi-quantitative investigation by spectrochemical methods of the elements found in Spanish soils during the last few years.

[694] (46)633.71-1.4
SEQUEIROS BORES, J. M. Algunas características agrológicas de las zonas tabaqueras españolas, zonas 4a. y 8a. (provincias de Cáceres y Ávila): I. Analisis mecanico. Determinaciones fisicas y analisis organico. [Some agrological characteristics of the Spanish tobacco zones 4a. and 8a. (Cáceres and Ávila provinces). I. Mechanical analysis. Physical and organic analyses.] *Bol. Inst. Investig. Agron. Madrid* No. 15, 1946 (195-227). [Sp.]

23 soils of a dry area ranking second in production of Spanish tobacco fall into 3 groups in ascending order of resistance to mechanical weathering: soils formed (1) above gneiss and mica, (2) above granite, (3) above quartzite. Carbonates are absent and pH values vary with the basicity of the parent rock from 6.3-7.4, 4.8-6.0, and 4.3-6.5 respectively. Cultivation increases acidity and the dispersion of these naturally skeletal soils. Humus content did not depend on soil type and was mostly between 2.5 and 4.5% and unsaturated. This rather high content for arid Spanish soils is valuable in correcting soil looseness and thus protects the inorganic colloids. The importance of manuring to maintain this humus content, and of liming and avoiding heavy irrigation is stressed.

[695] (47)631.4
LAZAREV, A. A. [A brief review of the fundamental scientific research work done in the last thirty years at the soil institute of the Academy of Sciences, U.S.S.R.] *Pochvovedenie* 1947 (625-634). [R.] [Dokuchaev Soil Inst., Moscow]

The work falls under four main headings (1) soil geography and cartography, (2) soil genesis, (3) soil fertility, (4) soil erosion.

(1) Work is proceeding on the construction of a soil map of the U.S.S.R. on the scale of 1:1,000,000, using a revised system of soil classification, the main feature of which is the grouping of soils into *types*, distinguished according to soil profile, *sub-types*, distinguished by qualitative differences in the genetic horizons, and *varieties*, distinguished by degree of development. (2) Work on soil genesis has centred round studies of the mineralogical and organic composition of soils, of the physico-chemical proportions of soils, and of the inter-relations of soils and plants. Special attention has been paid to problems of the genesis and utilization of saline soils. (3) The main problems of soil fertility that have been studied have been connected with the use of mineral fertilizers. (4) Erosion studies have been devoted to mapping the incidence of erosion in the Union, elucidating the mechanics of erosion and measuring the erodibility of soils.

[696] (47)631.4
POLYNOV, B. B. [Special features in the development of Soviet soil science.] *Pochvovedenie* 1947 (577-582). [R.]

Post-revolutionary soil science in the U.S.S.R. has developed along the lines initiated by Dokuchaev who regarded the evolution of the soil as indissolubly connected with that of the landscape. The main achievements of Russian soil science have been in the field of soil geography and in the study of soil organic matter, weathering and soil salinization. Laboratory studies have played a lesser role, and emphasis has always been laid on the study of the soil in its natural condition. In humus studies attention has been directed to the differences in the composition of humus of different soil types. As regards colloid chemistry, there was a time in the 1930's when foreign workers, notably Wiegner and Mattson, seemed to be leading the Russian scientists,

but this could be excused on the grounds that the foreigners had themselves been greatly influenced by Dokuchaev, and later the Russians recovered the lead. The work of Prasolov in cartography has been outstanding, and important contributions have been made by Russians in the ancillary sciences of petrography, geochemistry and biology.

[697] (47)631.81
SOKOLOV, A. V. [Thirty years' work of Soviet agronomy.] *Pochvovedenie* 1947 (617-624). [R.] [Dokuchaev Soil Inst., Moscow]

Russian chemists claim to have been well ahead of others in developing the science and practice of mineral fertilizing ("chemization"). For this, special credit is due to K. A. Timiriazev, D. N. Prianishnikov and A. N. Englehardt.

[698] (471)631.4
PESOLA, V. A. Suomen kasvinviljelysalueet. [The natural growing regions in Finland.] *Acta Agralia Fenn.* 47, 1946 (1-146). Biol. Abs. 21 (1598).

Finnish soils vary from heavy clay to sand, and the country can be divided on meteorological and edaphic bases into 12 natural regions. 4 of these are main regions for wheat, rye and barley.

[699] (476)631.615
REGEL, C. The bogs and swamps of White Russia. *J. Ecol.* 35, 1947 (96-103).

The Polesje swamps of the Pripiet river are to be drained and ameliorated for agricultural use by irrigating the drained area with river water so that the mineral matter necessary for the growth of grasses is deposited on the acid peat. The Polesje soils should give big crops of vegetables, *Taraxacum* and hemp if manured with NPK fertilizers.

[700] (479)631.4: 551.432
TROITSKY, A. I. [The mountain-steppe soils of North Ossetia.] *Pochvovedenie* 1947 (568-572). [R.]

These soils cover about 15,000 ha. in intermont depressions, at altitudes of 1200-1550 m. They exhibit a brown humus horizon, a compacted horizon, deposition of carbonates, high humus content, some loss

of SiO_2 and Fe_2O_3 , a rather high Al content throughout the profile, absorbed Na in the upper horizon, high absorptive capacity and a predominance of Ca and Mg in the absorbing complex. The river-terrace soils, although they seldom cover areas greater than 5 ha., are suitable for dry or irrigation farming, the gentler slopes for grain and market gardening and the valley soils for market gardens and orchards.

[701] (479)631.671
AIDINYAN, R. KH. [The properties of Lake Sevan water in relation to irrigation.] *Pochvovedenie* 1947 (549-554). [R.]

The level of Lake Sevan is to be lowered by about 1 m. per year throughout some decades, and the possibility is discussed in detail of using the waters to irrigate 200,000 ha. of the Ararat lowland. The soluble salt content is 0.55 gm./l., largely Na and Mg, and the pH is 8.9. In view of the high Mg content, and especially the assumed presence of soda, it is calculated that within one decade Na would be present in the absorbing complex of the lowland soils to the extent of 10-20% of the total absorptive capacity. However, dilution of the Sevan waters with those of other sources available, together with a correct organization of irrigation and rotations, would prevent the emergence of solonetsic properties in the soil.

[702] (489)631.81
IVERSEN, K. Fosforsyre og Kali. [Phosphate and potash.] *Svenska Vall- o. MosskFören. Kvartalsskr.* 9, 1947 (161-178). [Da.]

A general review of fertilizer experiments in Denmark on the effect of phosphate and potash fertilizers in the presence and absence of farmyard manure with special reference to fertilizer-conditions during the war period and their effect on the present phosphate and potash status of Danish arable soils.—S.H.

[703] (498)631.4
VASILIU, A.; POP, L. Date asupra solului din comuna Chevereshul-Mare județul Timiș-Torontal. [Data on the soil of the commune Chevereshul-Mare, department Timiș-Torontal.] *An. Fac. Agron. Cluj* 11, 1946 (104-111). [Rm.f.]

[704] (51)631.459
CHEN, Y. **Soil erosion in Kweichow.**
J. Agric. Assoc. China Suppl. No. 50, 1945
(50-51).

Descriptions are given of the physiography, climate, soils and cropping practices in Kweichow. Measurements are reported on the rate of erosion in representative localities and on the muddiness of rivers. Observations are made on eruptions, overlying of cultivated fields, stoppage of rivulets, the thickness and the water content of surface soils, and the loss of fertility of farming lands. The seriousness of the problem is discussed and a number of control measures are suggested, such as terracing, contour planting, irrigation and drainage improvement, and the development of pastures and forests.

[705] (52)631.4
SWANSON, C. L. W. **Reconnaissance soil survey of Japan.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (493-507). [Conn. Agric. Expt. Sta., New Haven]

Since the war, American scientists have been making a soil survey of Japan as part of a scheme to promote food production. It is admitted, however, that the rather small scale of the map is not adequate for purposes of planning land use. The map units employed are soil associations, and are not homogeneous. The history of soil-survey work in Japan is described, and short accounts are given of physiographic and geological factors, climate and vegetation as affecting the distribution and formation of soils. Owing to the hilly nature of the land, not more than 16% of the total area is under cultivation. Large areas are covered by volcanic-ash soils which, when of recent origin, have little agricultural value. Volcanic-ash soils are especially low in available P. P is the main fertilizer requirement. Much of the K requirement is supplied by wood and straw ashes which are widely used. Before the war Japan was one of the heaviest users of chemical fertilizers. The most important crop is paddy rice which occupies nearly all the land to which water can be applied. Wheat, barley, vegetables and white and sweet potatoes are the main upland crops.

In earlier surveys soils were differentiated mainly according to texture and geology. It was thought that the American and inter-

national systems of classifications would not fit Japanese soil types. Difficulties have been encountered in this survey in adapting Japanese soils to the "great soil groups" of the U.S. Soil Survey.

[706] (52)631.81
SWANSON, C. L. W. **Fertilizers and food production in Japan.** *Fert. Rev.* 22, No. 5, 1947 (7-11). [Conn. Agric. Expt. Sta., New Haven]

An account is given of the major food crops of Japan and of the use of composts and commercial fertilizers. Fertilizers for different crops are recommended.

[707] (54)631.459
HALL, W. T. **Erosion in the Jumna and Chambol ravines.** *Indian Forester* 73, 1947 (195-198).

Comments on a report made by Dr. Shubart of the U.S.A. who visited the United Provinces in 1945.

[708] (54)633.51-1.5
PATEL, P. L. **Improvement of cotton in middle Gujarat.** *Indian Cott. Grow. Rev.* 1, 1947 (184-189).

Cotton is grown chiefly on black cotton soil to which little farmyard manure is applied. Fertility is maintained by 3-year rotations with wheat and a legume. Green manuring and fallowing are practised. The land is harrowed 2 or 3 times, and sowing is done in the dry mulch in June. After thinning, the cotton is inter-cultivated with a heavy blade harrow. If there is excess moisture in the soil the land is inter-ploughed to expose the wet soil.

[709] (54)633.61-1.5
KHANNA, K. L. **Sugarcane in Bihar. II. Cultural aspects (North Bihar).** *Indian Farm.* 8, 1947 (170-174).

There are roughly 450,000 acres under sugar cane, much of which is grown without irrigation. It is essential to conserve all possible soil moisture during the period between the rains and planting the crop. Frequent cultivation is necessary between the cessation of the monsoon and early spring. Green manuring is an indispensable practice, as the soils are light and deficient in humus.

[710] (54)633.73-1.5
MAYNE, W. W. **Coffee planting in South India. An example of conservation agriculture in the tropics.** *Trop. Agric. Trin.* 24, 1947 (54-56).

About 100 years ago areas of 20-30 acres in existing evergreen forest on steep slopes were planted with coffee. The undergrowth was cut and allowed to decay without burning. Planting was close, never more than 6 feet \times 6 feet, often without planting lines. Shortage of labour may have helped to protect the soil from damage by excessive cultivation. Some estates are still in economic production in areas with an annual rainfall of 150 inches.

[711] (548.7)631.4: 581.5
CHAPMAN, V. J. **The application of aerial photography to ecology as exemplified by the natural vegetation of Ceylon.** *Indian Forester* 73, 1947 (287-314). [Auckland Univ., N.Z.]

An account is given of the principal vegetation types as seen from both the air and the ground. Descriptions of soil profiles associated with the different plant associations are also given.

[712] (584)631.445.3
GERASIMOV, I. P.; LIVEROVSKY, YU. A. **[The dark brown soils of the nut woods of Central Asia and their paleogeographical significance.]** *Pochvovedenie* 1947 (521-532). [R.]

Different authors have grouped these walnut-wooded medium-clayey to fine-clay soils with chernozems, rendzinas, brown soils and brown forest soils. They occur on lower-quaternary loess deposits at heights of 1000-2000 m. in the western Tien Shan and in the Fergan and Chatkal ranges, and differ essentially from typical brown forest soils in their thick illuvial carbonate horizon, thick nut-structured humus layer (up to a metre thick) and in their water regime of severe wetting alternating with a long period of severe drying. Ca, exchangeable bases, P and total and easily hydrolysable N are high, and the pH varies from 7.4 to 7.7.

[713] (59)631.81
ANGLADETTE, A. **Le problème des engrais en Indochine. [The fertilizer problem in Indo-China.]** *Agron. Trop.* 2, 1947 (490-530). [F.]

As a plan for the industrialization of Indo-China envisages considerable production of fertilizers, the problems relating to their use are studied. The main crops are rice, sugar cane, maize, manioc, tobacco, rubber, coffee, tea, fruit and coconut, and the results of fertilizer experiments with these crops during the last 50 years are summarized. Data of soil types, plant-nutrient requirements with corresponding amounts of fertilizers and the increases in yields anticipated as a result of fertilizer application are tabulated.

Indo-Chinese soils and their degree of fertility are described. The alluvial soils of the Cochinchina delta and the lower Mekong where rice is the main crop are predominantly silt-clay or clay-silt with pH values varying from 3.5 to 7.5. Those with a low degree of base saturation could be improved by the incorporation of clay-humus colloids. Farm manure, green manure and compost are beneficial for the light, but not the heavy, soils. On the saline soils rice cannot tolerate more than 4 gm./l. of NaCl while the alum-containing soils are toxic at pH 4.5, in the presence of sulphate, and when the Al content of the soil solution is greater than 50 mg./l. Numerous soil analyses have been carried out, but results have not been agronomically interpreted as a function of yield. In the sedentary soils which are grey or red earths of basaltic or granitic origin physical characteristics such as soil structure, water-retaining capacity, degree of lateritization and humus content are of primary importance and limit the value of mineral fertilizers. These properties can only be improved by the incorporation of humus which permits a more complete utilization of chemical fertilizers in soils deficient in colloids.

Few fertilizers are imported, and those locally produced comprise (1) phosphate deposits, although the Fe and Al contents are occasionally too high to permit their use, and bone meal, (2) oil cakes which have N contents of 4% for *Ricinus* and sesame, 3.5% for kapok, 3% for groundnut, 2% for cotton, copra and hevea and 1.5-2% for camelia and *Garcinia*, (3) fish meal, horn, leather and dried blood and (4) plant ashes.

It is concluded that yields could be considerably increased by the use of fertilizers and that more intensive cultivation could be adopted, especially of cereals.

[714] (676.2/9)631.47:312
HUMPHREY, N. **The Kikuyu lands: thoughts on the foundations of future prosperity in the Kikuyu lands.** *Colony and Protectorate of Kenya*, 1945 (18-60).

In future planning, land tenure, over-population, shifting cultivation, seasonal and perennial crops and the present cropping system should be considered. The pressure of population on the land must be reduced, the land must be farmed on conservation lines including afforestation schemes and land and water surveys, and human nutrition must be improved.

[715] (676.2/9)631.47:312
HUMPHREY, N. **The Kikuyu lands: the relationship of population to the land in South Nyeri.** *Colony and Protectorate of Kenya*, 1945 (1-15).

The relationship of population to available land and present land usage is discussed. An effort is made to estimate the area required to support a family and permit of proper land usage. On the basis discussed, about 14,000 families must leave the area as soon as possible.

[716] (677.3)63
MAUGINI, A. **La Somalia Italiana. [Italian Somaliland.]** *Rev. Agric. Subtrop.* 41, 1947 (221-233). [I.]

Historical with special reference to social development in recent years up to 1940, and briefly commenting on the post-war situation. A few facts are given regarding irrigation schemes; the scheme at Genale was a centre of banana production and export.—R.N.

[717] (678)631.4:631.47
MILNE, G. **A soil reconnaissance journey through parts of Tanganyika Territory, December 1935 to February 1936.** *J. Ecol.* 35, 1947 (192-265). [Late of E. Afric. Agric. Res. Inst., Amani]

The objects of the journey, mostly through semi-arid country, were to look for relationships of the principal soil types to each other and to the various natural factors concerned in soil formation. The catena complexes of soils with their associated vegetation, erosion and conservation measures including forest conservation, grazing and fire control, agriculture and land utilization are discussed. Soil profiles are described and limiting factors

of drought, lime-pan, hard-pan, rockiness, acidity and poverty in plant nutrients are pointed out for different vegetation types and for native cultivation. Although some soils may contain reserves of mineral nutrients their physical properties and liability to drought and flood make them incapable of utilization by primitive cultivators. They might be cultivated with more advanced agricultural methods if water were controlled.

Just as soil destruction in the tropics proceeds rapidly, so soil formation under favourable moisture conditions is a rapid process, and on some rocky hillsides might be deliberately fostered. The presence of termite mounds, containing large amounts of CaCO_3 , scattered over non-calcareous soils is discussed, and it is suggested that the lime should be redistributed as fertilizer.

It is stressed that in many of these poor soils exploitation by present non-intensive methods of peasant cultivation must cease and be substituted by sound farming and stock-owning practices with the use of fertilizers and composts. In advance of improved methods, intensified agriculture is most risky. Many areas, though over-grazed, if not over-cultivated by crude methods, may in due time become productive land. Observations on supervised ideal native holdings and experimental semi-intensive soil and vegetation surveys of sample sub-areas are advocated to build up an understanding of the processes and material factors that decide soil type and distribution in tropical dry country. Meanwhile a survey of land types and land uses, actual and potential, should be made before a rational land-utilization policy can be framed.

[718] (711)631.47
ANDERSON, W. J. **A study of land settlement in the Prince George-Smithers area, British Columbia.** *Canada Dept. Agric. Pub.* 794, 1947, pp. 58.

Includes brief accounts of soils, climate, arability, suitable crops and water supply in naturally-forested flat and undulating regions.

[719] (712.3)631.67
SPENCE, C. C.; KRISTJANSON, B. H.; ANDERSON, J. L. **Farming in the irrigation districts of Alberta.** *Canada Dept. Agric. Pub.* 793, 1947, pp. 66.

[720] (728.6)63 : 581.5
 OROZCO, C., J. M. Notas ecologicas. [Ecological notes.] *An. Col. Ing. Agron.* 2, 1946 (41-55). [Sp.]

An outline agricultural-ecological study of areas containing important grass, legume and tree species of the hot (Pacific) and temperate regions of Costa Rica.

[721] (728.6)631.4
 SÁENZ MAROTO, A. Geodafologia costaricense. [The geopedology of Costa Rica.] *Ann. Col. Ing. Agron.* 2, 1946 (11-35). [Sp.]

Costa Rica, because of extremely varied geological and climatic conditions, offers within an area of less than 20,000 square miles a variety of some 400 soils, ranging from red desert soils through brown, chestnut, black and podzolic to lateritic soils, together with solonchaks, half-bogs, rendzinas, solonchaks, etc. The commonest rocks are volcanic tobas with igneous intrusions, that give rise to soils with a high clay, moderate silt and low sand content, high in Fe, Al and Ti and low in SiO_2 and bases.

The occurrence of the main rock and soil types is treated in outline and tables are provided of the depth, pH and nutrient contents of the soils of about 50 cantons in various provinces. A short soil and geological study is included of the Reventazon valley, the seat of the Inter-American Institute of Agricultural Science.

[722] (729.1)631.4
 GONZALEZ, A. DE J. [Agro-geology of pastures; geology and soils of Cuba in relation to cattle raising.] *Cuba Min. Agric. Ganad.* 1946, pp. 56. C.A. 41 (7335).

A description of the physiographic provinces of Cuba with detailed analyses of the rocks and soils, with special emphasis on the effect of the chemicals present on the vegetation and through it on the cattle.

[723] (729.1)631.445.7
 GONZALEZ, A. DE J. [Agro-geology of pastures; the origin of some red earths of the island of Cuba.] *Cuba Min. Agric. Ganad.* 1946, pp. 38. C.A. 41 (7334).

A historical survey of investigations made on the red earths. Comparisons are made between the chemical analyses of limestones and their derived soils.

[724] (729.8)631.432.2 : 551.577
 HARDY, F. Effective rainfall and soil moisture in Trinidad. *Trop. Agric. Trin.* 24, 1947 (45-51).

An "effective-rainfall" map and a "soil-drainage" map of Trinidad are described. The "effective-rainfall" or "soil-humidity" map shows the distribution of areas (1) continuously moist, (2) with a weak dry season having only 1 or 2 dry months a year, (3) with a marked dry season having 4 or more dry months a year, (4) with a strong dry season where soil desiccation is a prominent feature. The areas are differentiated by the application of Mohr's evaporation formula $E = 2.4 + \frac{1}{8} R$ for monthly rainfalls. The continuously moist zone includes most of the forest reserves and the chief cacao estates. The zone with a marked dry season coincides roughly with the belt with rainfall below 70 inches a year and comprises most of the sugar lands.

The soil-drainage map shows areas of (1) free drainage, (2) partially impeded drainage, (3) impeded drainage and (4) alluvial flats and swamps. It is concluded that certain impeded-draining soils have become impaired through erosion which has reduced surface infiltrability so that the profiles remain dry even in wet seasons. Catchment drains and field drains for preventing floods within alluvial flats should be provided. The litter and crumb layer over the soil surface that imparts high infiltrability to forest and cacao lands should be maintained.

[725] (73)631.47 : 631.459
 GRIFFITH, A. L. Soil erosion surveys. *Indian Forester* 73, 1947 (145-154).

A description of the official U.S. method of carrying out erosion surveys.

[726] (73)631.62
 SUTTON, J. G. Nation-wide conservation drainage operations. *Agric. Engng.* 29, 1948 (22-27).

Review of drainage operations of the S.C.S. in different regions of the U.S.A.

[727] (73)631.812
 JACOB, K. D.; MEHRING, A. L. Progress in manufacture and use of fertilizers. *Agric. Chem.* 2, No. 12, 1947 (21-24, 61, 63, 65, 67).

A review in general terms of developments in U.S.A.

[728] (74)631.47
ADAMS, H. R. **Some soil factors which affect land use in the glaciated Allegheny Plateau of southern New York.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (448-451).

About a third of the land of the region is devoted to agriculture, a third to woodland, and a fifth to pasture. Steepness of slope is a major factor affecting land use. Agricultural soils are mostly fairly deep, and the proportion of agriculturally utilized land increases with the lime content of the soil parent material.

[729] (75)631.417
THOMPSON, L. G., JR.; SMITH, F. B. **Organic matter in Florida.** *Fla. Agric. Expt. Sta. Bull.* 433, 1947. *Fert. Rev.* 22, No. 5 (15).

In Florida, soils low in N and high in C stimulate the growth of moulds and other micro-organisms which compete successfully with higher plants for available N. N should be added when organic matter is incorporated in the soil, especially if a crop is to be planted soon after the organic matter is added.

[730] (77)631.4
SCHRADER, W. D. **Soil associations of northern Missouri.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (458-463). [Univ. Missouri]

A progress report on soil studies made during the last 50 years. The major soil groups are grey-brown podzolic, prairie soils and planosols.

[731] (78)631.414.2 : 549
LARSON, W. E.; ALLAWAY, W. H.; RHOADES, H. F. **Characteristics of the clay fraction of various horizons of Scott silt loam and Pawnee silt loam.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (443-447). [Neb. Agric. Expt. Sta., Lincoln]

The soils, formed in a sub-humid to semi-arid climate, contained a montmorillonite-type clay with marked amounts of crystal-lattice iron.

[732] (79)631.44
STORIE, R. E. **Soil regions of California illustrated by twenty-four dominant soil types.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (425-430). [Univ. Calif. Berkeley]

Twelve soil regions are distinguished, primarily according to rainfall, geology, natural vegetation and topography. Within each region a certain zonal soil condition exists, modified by local variations in parent material, topography and drainage.

[733] (798)631.4
ULRICH, H. P. **Morphology and genesis of the soils of Adak Island, Aleutian Islands.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (438-441). [Purdue Univ., Lafayette, Ind.]

A typical soil has a thick covering of 2 feet or more of well decomposed, fibrous organic matter overlying a shallow, well drained mineral soil. The cool, moist climate and the predominantly grass vegetation are the main factors in soil formation. Weathering and the nature of the parent material are of less importance. At high altitudes accumulation of organic matter diminishes owing to diminished vegetation.

[734] (81)633.18-1.5
MENDES, C. T. **A rotação de culturas. [On rotation of crops.]** *Rev. Agric. Piracicaba* 21, 1946 (319-326). *Biol. Abs.* 21 (1763).

In São Paulo rice is cultivated on the high and low lands. Crop rotation involving the growing of green manure is practised on the high lands, but is not practicable on the low or irrigated regions.

[735] (82/83)631.4
VESSEL, A. J. **Soil association areas of Argentina and Chile.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (464-473). [U.S.D.A.]

A generalized soil map, compiled mainly deductively from climatic and vegetation data, of the southern part of South America is presented. Six climatic zones are distinguished, each containing 6-10 different soil types which are named to correspond to the major soil groups recognized by the U.S. Soil Survey.

[736] (86)631.4 : 552.323
FRANCO, U. A. **Characteristics and relationships of soils from volcanic tuffaceous materials in Colombia, South America.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (431-437).

[737] (86)633.51-1.5
FONSECA GAMARRA, J. Recomendaciones sobre el cultivo del algodón en Colombia. [Advice on cotton-growing in Colombia.] *Agric. Trop. Bogotá* 3, 1947 (9-15). [Sp.]

Includes sections on soils, cultural operations, fertilizers, sowing and protection.

[738] (931)631.4
POHLEN, I. J. ; HARRIS, C. S. ; GIBBS, H. S., ET AL. Soils and some related agricultural aspects of Mid Hawke's Bay. *N.Z. Dept. Sci. Indust. Res. Bull.* 94, 1947, pp. 176.

With accompanying soil maps.

[739] (931)631.47
CONNELL, R. P. Farming in New Zealand. The Canterbury district. *N.Z. J. Agric.* 75, 1947 (369-383).

With maps showing the mean annual rainfall of the area for 1901-1930 and land utilization in the district.

[740] (931)633.491-1.81
LEITCH, C. C. New Zealand's potato crop. *N.Z. J. Agric.* 75, 1947 (489-496).

Potatoes are generally sown after grass as a preparatory crop to wheat. On lighter soils 3-4 cwt./acre of 3 parts of super. to 1 part of $(\text{NH}_4)_2\text{SO}_4$ should be applied and on richer sandy, silty loams 5-6 cwt./acre of 5 parts of super. to 1 part of $(\text{NH}_4)_2\text{SO}_4$ are necessary. 1 cwt./acre of K_2SO_4 may be added. Fertilizer should be applied with the seed. If a green-manure crop has been grown, it should be ploughed in at least 6 weeks before potatoes are planted.

[741] (94)631.821.1 : 631.816.3
HARDY, W. D. A new development in liming. Crusher to paddock service. *Agric. Gaz. N.S.W.* 58, 1947 (507-511).

The "crusher-to-paddock service" is described in which ground limestone is spread by special trucks without handling by the landowner, thereby reducing costs. Although beneficial, liming has been considered too costly for general use under Australian conditions.

[742] (943)631.459 : 631.61
VALLANCE, L. G. A soil erosion control experiment in the Isis district. *Cane Grow. Quart. Bull.* 10, 1947 (118-128).

In the Isis area of Queensland soil fertility has deteriorated on steep upper slopes of 10-16% gradient where, after 50-60 years of cropping, cane growing is no longer profitable. The soils are deep, red basaltic loams, the clay content increasing with depth. Under virgin conditions, they are fertile, well supplied with humus and of good crumb structure.

An experiment was carried out on an area of 7 acres which had been cultivated to cane for 40 years with no rotation. The land was terraced by a road grader with a 12-foot blade which cut a broad, shallow channel and threw the soil down hill to form a mound. The run-off water from the heavy rainfall was carried in the channel. Each terrace had a slight gradient, and the main channel outlet was protected with earth-filled bags forming a shallow V at suitable places, and planted with *Paspalum* and elephant grass.

[743] (944)631.4
ROE, R. Preliminary survey of the natural pastures of the New England district of New South Wales and a general discussion of their problems. *Aust. Counc. Sci. Indust. Res. Bull.* 210, 1947, pp. 26.

The New England district is a terraced tableland of 3200-4000 feet altitude, much of which has been eroded. The soils are derived from granite, basalt or miscellaneous rocks. Sandy soils derived from granite predominate, and grey leached podzol is common. Much of the podzolization has occurred in lateritic material and, according to the extent of erosion, clay or clay-loam soil with ironstone gravel at or near the surface may occur. In some areas transported laterite forms the basis of the soil material. The study of land use in this district requires investigation into problems of sown pastures and soils.

[744] (946)631.473
HUBBLE, G. D. A soil survey of part of Waterhouse Estate, County of Dorset, North-east coast, Tasmania. *Aust. Counc. Sci. Indust. Res. Bull.* 204, 1946, pp. 63.

[745] (961)633.18
 HARWOOD, L. W. ; JAN, S. R. **Five years of
 padi production in the Northern Division.**
Fiji Agric. J. 18, 1947 (43-46).

The varieties, conditions of land tenure and marketing, planting programme and pests and diseases concerning the production of padi by peasant farmers in the islands of Vanua Levu and Taveuni are described.

[746] (969)631.811.4
 SHERMAN, G. D. ; FUJIMOTO, C. K. ;
 KANEHIRO, Y. **Lime requirement of
 acid Hawaiian soils.** *Hawaii Agric. Expt.
 Sta. Rept.* 1944-1946, 1947 (52-54).

The acid soils of Hawaii can be divided into 3 groups according to their degree of base saturation. (1) has low base saturation and low content of exchangeable Ca and Mg, (2) has base saturation of 35-60% and varies greatly in its degree of saturation with both

Ca and Mg, (3) comprises soils with slightly acid reaction and a base saturation higher than 60%. (1) and (2) require lime for maximum production of many vegetable and crop plants. Some of group (1) have been leached so that the base saturation of 1-10% has been reached and the pH is 3.8-4.5. The potentially active Mn in these soils varies from 750 to 25,000 lb./acre-foot of soil. Mn toxicity, the low level of available Ca and sometimes Mg, and the high fixation capacity for phosphates limit the growth of plants on these soils. Beets, radishes and spinach improved in growth and yield when dolomite was applied instead of hydrated lime.

In group (2) if the soil has a high exchangeable Ca content little benefit results from the application of lime. Soils with a high Mg content require a heavy application of lime. The soils of group (3) do not require lime.

INDEX TO AUTHORS

- Åberg, Å., 598
 Adams, H. R., 728
 Adams, J. R., 575
 Afanasiev, M. M., 640
 Aidinyan, R. Kh., 701
 Åkerman, Å., 600
 Albrecht, W. A., 681
 Allaway, W. H., 731
 Allison, F. E., 522, 570
 Alvarez Querol, M.C., 540
 Anderson, J. L., 719
 Anderson, W. J., 718
 Andrews, E. D., 560
 Andrews, W. B., 568
 Angell, H. R., 604
 Angladette, A., 713
 Appleman, M. D., 525
 Ariano, R., 460
 Atkinson, J. D., 682
 Attoe, O. J., 430, 449
 Ayres, A. S., 431

 Babé, E., 611
 Baeza, M. A., 625
 Ballenegger, R., 689
 Ballu, T., 690
 Bannon, J. K., 408
 Barbier, G., 421, 422
 Barody, G., 529
 Bartholomew, R. P., 573, 574
 Bartholomew, W. V., 518
 Batista A. Chaves, 662
 Batjer, L. P., 652
 Batten, E. T., 469
 Bear, F. E., 581
 Bendixen, T. W., 458
 Becquerel, P., 544
 Bennet, H. H., 547
 Beran, F., 594
 Berg, H., 558
 Berger, K. C., 427, 630
 Bernuth, I. von, 632
 Bodea, C., 526, 527
 Boischot, P., 417, 453
 Bonnet, J. A., 420
 Botvay, K., 462
 Brady, N. C., 490
 Braid, K. W., 586
 Broadbent, F. E., 517
 Brown, A. L., 498
 Brown, B. E., 624
 Brown, D. D., 643
 Browning, D. R., 474
 Browning, G. M., 481
 Bruin, P., 454
 Bryant, L. R., 588
 Bulcock, F. W., 620

 Cailleux, A., 494
 Caldwell, A. C., 498
 Caldwell, J. S., 624
 Cameron, G. S., 633, 642
 Campbell, J. C., 591
 Canniere, J. de, 459
 Carleton, E. A., 480

 Carlson, R. F., 587, 609
 Carlyle, R. E., 524
 Chabannes, J., 421, 422
 Chabrolin, C., 599
 Chaminade, R., 437, 438
 Chapman, V. J., 711
 Chatelain, J., 472
 Chaverri, G., 500
 Chen, C. T., 463
 Chen, C. Y., 576, 680
 Chen, S. M., 673, 684
 Chen, Y., 704
 Chizhov, B. A., 556
 Chowdhury, S., 667
 Christie, J. R., 593
 Christopher, E. P., 663
 Churchill, B. R., 671
 Ciferri, R., 646
 Clare, K. E., 470
 Clarke, G. B., 484
 Clore, W. J., 674
 Coe, D. G., 573
 Collier, D., 539
 Comar, C. L., 424
 Connell, R. P., 739
 Culpepper, C. W., 624

 Davies, R. O., 614
 Dawson, R. C., 467
 Dawson, V. T., 467
 Day, W. R., 672
 Del Valle, C. G., 611
 Depoerk, R., 650
 Doran, W. L., 675
 Doyle, R. J., 641
 Dreiselbis, F. R., 549
 Duchaufour, Ph., 669
 Dulac, J., 668
 du Toit, J. J., 608
 Duyverman, J. J., 536
 Dyer, B., 564

 Edminster, T. W., 411
 Ellison, J. H., 625
 Ellison, W. D., 505
 Erdman, L. W., 618

 Farkas, A., 545
 Fellows, H., 602
 Feng, C. L., 481
 Finch, A. H., 678
 Fine, L. O., 574
 Fonseca Gamarra, J., 737
 Fowler, G. J., 582
 Franco, U. A., 736
 Free, G. R., 480
 Frey, E., 553
 Fripiat, J., 459
 Fujimoto, C. K., 432, 433, 746
 Fuleky, G., 623
 Fuller, W. H., 439, 440, 441

 Gaddy, V. L., 570
 Garbosky, A. J., 516
 Gardner, R., 636

 Gardner, R. A., 538
 Gardner, W., 472
 Gerasimov, I. P., 712
 Gerloff, G. C., 630
 Ghiggia, R. A., 550
 Gibbs, H. S., 738
 Gill, J. G., 635
 Glover, H., 688
 Goedewaagen, M. A. J., 626
 Gonzalez, A. de J., 722, 723
 Goodman, K. V., 414
 Gorbunov, N. I., 446
 Gornie, R. M., 535
 Gottschalk, L. C., 503
 ✓ Green, G., 638
 Greenwood, D. E., 590
 Griffith, A. L., 725
 Griffiths, A. E., 678
 Griggs, W. H., 664
 Grigsby, B. H., 671
 Groves, A. B., 653
 Guelbenzu, M. D., 693
 Gupta, B. S., 537
 Gurbaxani, M. I., 513
 Guyon, G., 654

 Hall, W. T., 707
 Hamence, J. H., 564
 Hamner, C. L., 609
 Hamner, K. C., 666
 Hance, F. E., 428
 Hardesty, J. O., 551, 575
 Hardy, F., 724
 Hardy, W. D., 741
 Harlow, E. H., 456
 Harrington, J. F., 676
 Harris, C. S., 738
 Harrold, L. L., 509
 Harwood, L. W., 745
 Hawkins, A., 627
 Hébert, J., 417, 453
 Herrero de Egaña, M., 442
 Hester, J. B., 583
 Hewitt, E. J., 629
 Heyns, O. S., 617
 Hibbard, A. D., 655
 Hill, K. W., 637
 Hines, R. C., Jr., 411
 Holtby, B. E., 492
 Hovden, A. A., 418
 Hovland, G., 572
 Hoy, B., 651
 Hoyos de Castro, A., 692
 Hua, M., 463
 Hubble, G. D., 744
 Humphrey, N., 714, 715
 Hupé, P., 494

 Iversen, K., 702

 Jacob, K. D., 727
 Jackson, M. L., 412
 Jan, S. R., 745
 Jeffries, C. D., 413, 447
 Jensen, H. L., 521, 523

- Johnson, E. M., 644
 Johnstone, D. B., 533
 Jones, B. A., 638
- Kanehiro, Y., 431, 432, 746
 Kew, A., 508
 Khanna, K. L., 709
 Killian, C., 506
 Kirkham, D., 457
 Kivenheimo, V. J., 531
 Knapp, R. B., 589
 Koblet, R., 628
 Kohnke, H., 475, 476
 Kononova, M. M., 436
 Koreniako, A. I., 519
 Krasilnikov, N. A., 519
 Krimgold, D. B., 504
 Kristjanson, B. H., 719
 Kroth, E. M., 482
 Kummer, F. A., 477
 Kunkel, R., 676
 Kusiuzina, L. A., 567
- Lamb, J., Jr., 480
 Larson, W. E., 731
 Lazarev, A. A., 695
 Leach, L. D., 685
 Leitch, C. C., 740
 Lenglen, 579
 Lillard, J. H., Jr., 411
 Liverovsky, Yu. A., 712
 Löhnis, M. P., 468
 Loo, T. Y., 673, 684
 Lopez de Azcona, J. M., 693
 Love, K. S., 552
 Lund, J. W. G., 534
 Lunt, H. A., 554
 Lutz, J. F., 444, 490
 Lyford, W. H., 495
 Lyons, E. S., 610
- McCalla, T. M., 483
 McCuen, G. W., 543
 MacEwan, D. M. C., 415
 MacHatton, T. H., 660
 McHenry, J. R., 491
 McKeon, C. J., 620
 Mackie, W. Z., 412
 McMillan, J. A., 687
 McVickar, M. H., 469
 Mados, L., 419
 Magee, C. J., 585
 Magness, J. R., 652
 Maliuga, D. P., 434
 Marel, H. W. van der, 499
 Marshall, T. J., 484
 Martens, P. H., 571
 Matuashvili, S. I., 520
 Maugini, A., 716
 Maume, L., 668
 Maurain, C., 409
 Mayne, W. W., 710
 Mehlich, A., 657
 Mehring, A. L., 727
 Mendes, C. T., 734
 Metalski, R. P., 496
 Miller, P., 569
 Milne, G., 717
 Milton, W. E. J., 614
 Mishustin, E. N., 528
- Monselise, S. P., 656
 Morris, H. E., 640
 Morse, H. H., 473
 Moussu, H., 506
 Mulder, D., 661
 Mullett, H. A., 620
 Munro, J. A., 589
 Mureşanu, P. L., 527
- Neller, J. R., 424, 426
 Nelson, W. L., 490, 621, 627
 Newell, L. C., 491
 Nielsen, J. L., 443
 Nightingale, G. T., 666
 Noonan, J. L., 683
 Norman, A. G., 435, 512, 517, 518
- Ochsner, F., 553
 Olmsted, L. B., 487
 Olson, R. V., 427
 Orozco, C. J. M., 720
 Otoy, F. J., 658
 Overholser, E. L., 659
- Page, J. B., 482, 488, 543
 Palmer, R. C., 651
 Papadakis, J. S., 423
 Parham, B. E. V., 595
 Parks, R. Q., 477
 Pat, Y., 596
 Patel, P. L., 708
 Peech, M., 445
 Pennington, R. P., 412
 Pepper, B. B., 591
 Perkins, A. T., 416
 Pesola, V. A., 698
 Pillai, S. C., 513
 Pinck, L. A., 570
 Plant, W., 686
 Platenius, H., 445
 Pohlen, I. J., 738
 Polyarkova, L. V., 634
 Polynov, B. B., 696
 Pop, L., 703
 Post, R. L., 589
 Prasad, S., 648
 Prichard, A. M., 560
 Prince, A. L., 581
 Principi, P., 691
 Pruitt, A. A., 471
- Rahn, E. M., 677
 Raleigh, G. J., 676
 Ramos, B. H. M., 451
 Ramser, C. E., 510
 Ray, S. H., 489
 Reed, J. F., 657
 Regel, C., 699
 Regeimbal, L. O., 652
 Régnier, R., 592
 Retzer, J. L., 538
 Rheinwald, H., 546
 Rhoades, H. F., 731
 Rhodes, A., 597
 Riegel, A., 613
 Rigg, G. B., 493
 Robbins, P. W., 671
 Robertson, D. W., 636
 Robertson, L. S., 475
 Rocchetti, G., 501
- Rodriguez Lopez, E., 461
 Roe, R., 743
 Rogers, H. T., 615, 616
 Rollins, H. A., 664
 Rosen, E., 563
 Ross, W. H., 551, 552, 575
 Rossiter, R. C., 619
 Rousseau, J., 544
 Ruiz, A. S., 693
 Russell, J. J., 448
- Sabourova, P. V., 601
 Sáenz Maroto, A., 721
 Saeman, W. C., 569
 Sanford, G. B., 631
 Sauerlandt, W., 485
 Schafer, E. G., 588
 Schmidt, E. L., 530
 Schollenberger, C. J., 425
 Schrader, W. D., 730
 Schroeder, E. W., 548
 Schroeder, R. A., 681
 Schulz, G., 486
 Schuylenborgh, J. van, 478
 Sears, O. H., 525
 Segalen, P., 437
 Sehiakov, S. N., 479
 Semb, G., 572
 Sequeiros Bores, J. M., 694
 Shanks, J. B., 489
 Shelton, F. A., 583
 Sherman, G. D., 432, 433, 452, 746
 Shkolnik, M. Ya., 559
 Shulkcum, E., 469
 Shutak, V., 663
 Slagg, C. M., 602
 Slater, C. S., 458
 Smith, F. B., 729
 Smith, G. E., 583
 Smith, O., 625
 Smith, R. M., 474
 Smith, T. E., 645
 Smith, Y., 407
 Snider, H. J., 566
 Snyder, W. C., 685
 Sokolov, A. V., 697
 Soloveva, A. I., 634
 Spannagel, 542
 Spence, C. C., 719
 Stanberry, C. O., 674
 Stephens, C. G., 502
 Stoddard, D. L., 679
 Stokkink, G., 459
 Storie, R. E., 732
 Störmer, K., 632
 Sutton, J. G., 726
 Swanson, C. L. W., 705, 706
 Swift, E. G., 639
- Tabayoyong, F. T., 577
 Takahashi, M., 431
 Takazawa, F., 452
 Tamés Alarcón, C., 497
 Tamm, O., 670
 Taylor, G., 564
 Tchan, Y. T., 514
 Templeman, W. G., 597
 Tendeloo, H. J. C., 555
 Thellot, B., 599
 Thompson, L. G., Jr., 729

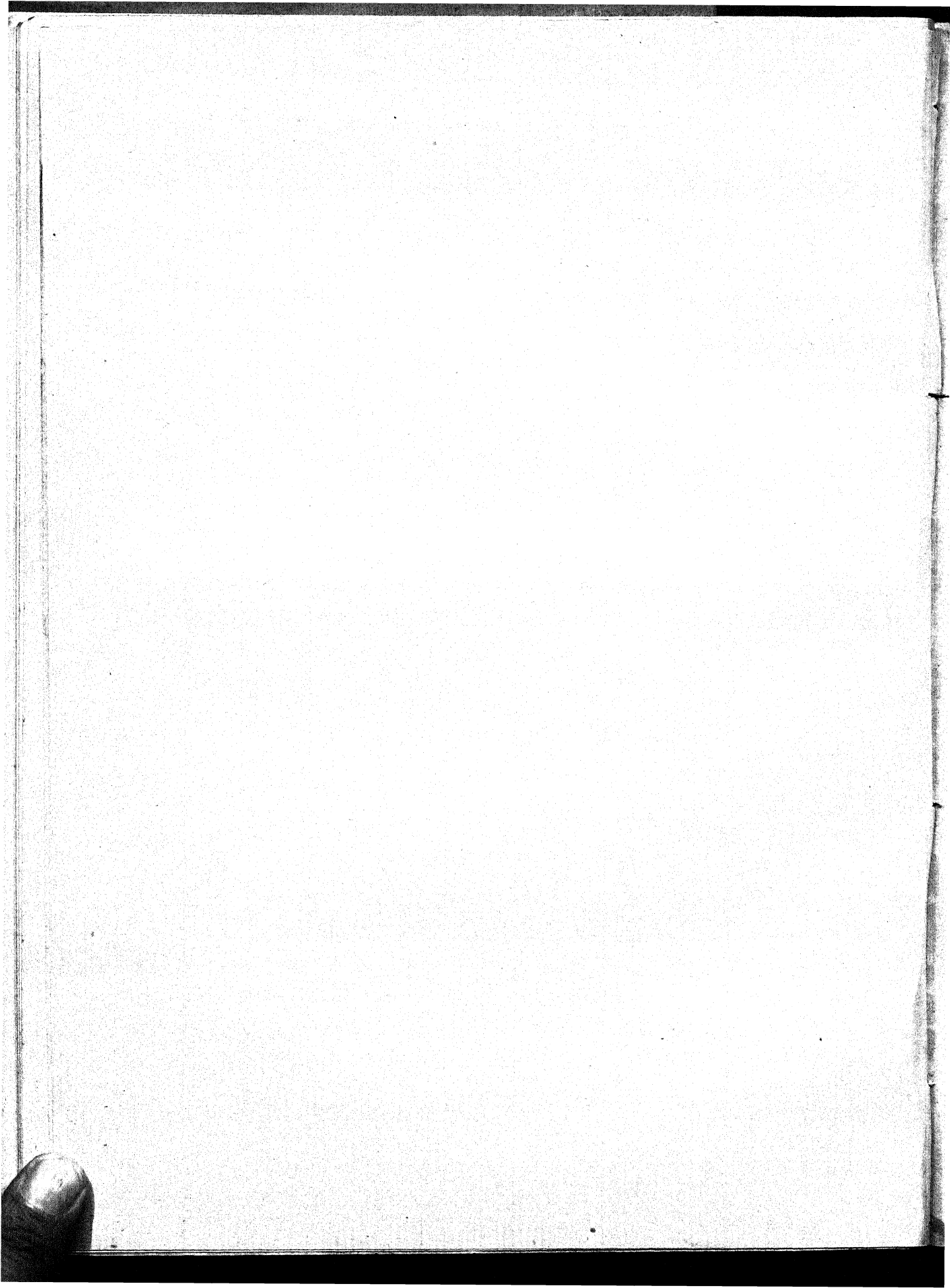
Thornton, G. D., 622
 Thorpe, J. D., 524
 Tilt, J., 605
 Timonin, M. I., 607
 Timson, S. D., 580, 647
 Troitsky, A. I., 700
 Truog, E., 449, 561
 Tschan, Y. S., 465
 Tsiurupa, I. G., 446
 Tukey, H. B., 609
 Turk, L. M., 496
 Uhland, R. E., 507
 Ulrich, H. P., 733
 Vallance, L. G., 742
 Valleau, W. D., 644
 Várallyay, G., 450

Vasiliu, A., 703
 Vervelde, G. J., 555
 Vessel, A. J., 735
 Vincent, C. L., 588
 Visser, W. C., 464
 Vistelle, R., 437, 438
 Vries, O. de, 454

Wadhvani, T. K., 513
 Waksman, S. A., 515
 Walker, A. L., Jr., 557
 Wallace, T., 629
 Wan, H. C., 410
 Wander, I. W., 562
 Wang, T. T., 576
 West, B. G., 443
 Whelan, L. A., 649

White, N. H., 603
 Whittaker, C. W., 551, 573
 Wilcox, J. C., 651
 Willard, C. J., 488, 543
 Willigen, A. H. A. de, 626
 Wilson, C. A., 591
 Wiltshire, G. R., 511
 Winter, A. G., 466
 Witkowsky, E., 455
 Wittwer, S. H., 655, 681
 Wolcott, A. R., 587
 Wyatt, J. H., 565

Yang, S. J., 612
 Yarilova, E. A., 541
 Zwart Voorspuij, A. J., 555



SOILS AND FERTILIZERS

Vol. XI

1948

No. 3

ANHYDROUS AMMONIA AS A FERTILIZER

Anhydrous ammonia is increasing steadily in favour as a fertilizer in the United States. Its use has so far been confined mainly to the south-eastern parts of the mid-western States. The possibility of using free ammonia as a fertilizer was pointed out by Tiedjens and Dobbins ⁽¹¹⁾ in 1931 as the result of a series of experiments to compare the utilization of ammonium and nitrate nitrogen by crop plants. Investigations at Idaho Agricultural Experiment Station ^(6, 12) indicated that the application of anhydrous ammonia to soils of low fertility would be profitable if manure was not available, although in one experiment where high yields of potatoes were given on the control plots the increases in yield due to the use of ammonia scarcely paid for the cost of application. The residual effect on wheat was nil. Forde and Proebsting ⁽⁵⁾ found that ammonia applied to peach and prune orchards behaved in essentially the same way as sulphate of ammonia, and Andrews and his collaborators ^(1, 2, 3) have demonstrated that the response of cotton, maize and oats to anhydrous ammonia at least equals that to ammonium nitrate.

The early methods of applying anhydrous ammonia involved its solution in irrigation water. In 1934 the Shell Development Company ⁽⁹⁾ patented a process in which anhydrous ammonia was led from a storage cylinder into the irrigation water. A disadvantage of this method was that with more than 445 p.p.m. of calcium bicarbonate in the water the concentration of ammonia had to be kept below 70 p.p.m. to prevent the deposition of calcium carbonate in the valves of the pipe lines. A further disadvantage was that the ammonia could not be applied without irrigating the land. In 1939 the same company patented a second process in which anhydrous ammonia was applied directly to the soil from a cylinder mounted on a cultivator frame.⁽¹⁰⁾ Suitable equipment has also been developed at the

Mississippi Experiment Station in conjunction with the Tennessee Valley Authority.^(2, 4) A propane flame-cultivator tank and mounting in which the bronze valve and fittings had been substituted by steel fittings were found to be suitable. Originally, a standard 100-gallon anhydrous-ammonia tank containing 410 lb. of nitrogen was mounted on the side of a tractor and provided with a seamless, high-pressure hose feed line, control valve, distribution line and applicator shank. Later, 2- and 4-row equipment was developed by incorporating a manifold into the system. In this case the tank was mounted at the rear of the tractor to facilitate loading from the storage tanks. These were usually of 1000-gallon capacity, contained 4100 lb. of nitrogen and were trailer-mounted. A rubber hose was substituted for the metal hose as vibrations soon caused the latter to leak. A metering device was connected through the manifold and distribution lines to a pipe or hose fixed on the back of the applicator foot. The requirements to be met in designing the applicators were that the ammonia should be released under the soil, trash should be shed freely and the expanding ammonia should not cause freezing of soil and water to the applicator. As the efficiency of anhydrous ammonia as a fertilizer depends very largely on its immediate sealing in the soil, disc hillers were set behind the applicators, but 4-inch sweeps were adequate in friable soils with little trash.

The quantity of anhydrous ammonia which should be applied depends on the crop, general soil conditions and time of application. Leavitt⁽¹⁰⁾ cites the following amounts per acre as giving good average results:—

- (a) barley, flax, oats, wheat and rye, 30-60 lb.
- (b) fruit and nut crops, 65-175 lb.
- (c) legumes, 40-90 lb.
- (d) vegetables, 50-130 lb.

As the preference of young plants is for nitrogen in the ammonium form and that of older plants for nitrate, Andrews recommends applying anhydrous ammonia immediately before planting or while the crops are in the seedling stage. If applied too far in advance of sowing, the ammonia becomes converted to leachable nitrate, a process which takes 4-6 weeks in warm weather in fertile, well aerated soils, but which is slowed up by wet heavy soils, acid conditions and cold weather. Usually the combination of planting and fertilizing in one operation is ideal. Leavitt suggests spring and autumn applications for peach orchards.

Application of ammonia as a top dressing is unsatisfactory owing to the necessity for sealing. Covering is also important in side dressings to prevent exposure of the crops to the ammonia fumes which may kill young plants. The depth at which the fertilizer should be placed varies with soil conditions, but at the Mississippi Station application at 4-6 inches has been sufficient to ensure complete sealing and absorption and to give satisfactory results.

The adequacy of these depths is confirmed by the work of Jackson and Chang⁽⁷⁾ who carried out laboratory studies of the absorption and loss of ammonia after its application at various depths to heavy soil, silt loam and light sand at rates corresponding to 60 and 600 lb. of nitrogen per acre. Beach sand was used as a reference. Of depth, texture, pH, lime content, moisture content and tilth, depth was the most important factor in ensuring complete absorption, although moist and dry silt loam at pH 6.4 conserved more than half the ammonia given even when applied at the surface. Except for the beach-sand control, no ammonia escaped from any soil after application at the 4-inch depth at the lower rate or from moist soils at the higher rate. Texture, on the other hand, had little effect on absorption, a finding which is in agreement with that of Jenny and his collaborators,⁽⁸⁾ nor did high pH values or coarseness of the aggregates promote loss of ammonia. Retention was always greater by soils in the field-moist than in the air-dry condition, but loss from the latter was small, and it is suggested that the moisture factor can be neglected in the

field, especially in view of the importance of the clay content. Jenny *et al.* established that dry clay is able to absorb NH_3 molecules from vapours containing ammonia and water, some molecules apparently being held loosely on the surface of the clay particles and capable of removal by aeration, while others combine with the hydrogen ions of the lattice. The combination of ammonia with hydrogen colloid to form ammonium colloid is suggested by Jackson and Chang as a mechanism by which the gas is absorbed in acid soils. These authors also suggest the physical absorption on soil particles, solution of ammonia in the soil moisture with subsequent decrease in its rate of diffusion, and the formation of Ca-NH_4 colloids in neutral soils as possible mechanisms of absorption. The reaction of ammonia with the hydrogen ions of the clay is reflected in its cation-exchange reactions. When ammonium salts such as the chloride and sulphate are added to clays, the ammonium ions absorbed correspond in amount to the cations released, but the ammonium ions absorbed from the NH_4OH are far in excess of the bases liberated. Jenny *et al.* found in addition that excised barley roots accumulated nitrogen as easily from ammonium-clay suspensions as from ammonium-sulphate solutions, also that absorbed ammonia was easily nitrified.

There seem to be few serious drawbacks to the use of anhydrous ammonia as a fertilizer. From the theoretical standpoint it appears to be generally as efficacious as ammonium salts, and has in addition the advantage of not containing anions to remain in the soil solution and set up acid conditions. A possible disadvantage is that alkaline conditions might be set up by the solution of ammonia in water and by the production of calcium hydroxide in soils containing exchangeable calcium. This might result in the development of trace-element deficiencies. As regards price, anhydrous ammonia compares favourably with other commonly used sources of nitrogen. The following retail prices of nitrogen in the State of Mississippi are quoted by Andrews *et al.*⁽²⁾

Anhydrous ammonia	6 cents/lb.
Ammonium nitrate	10 cents/lb.
Cyanamide	13 cents/lb.
Nitrate of soda	16 cents/lb.

As anhydrous ammonia is 82% nitrogen, freight charges are low compared with those for nitrogen in less concentrated form. Less storage space is required, but an initial outlay for storage and tractor equipment is usually necessary. Labour costs are reduced considerably as the application process can be combined with other operations such as listing, planting and cultivating without much loss in the acreage covered per day. Distribution is more uniform than that of solid fertilizers. Although certain safety measures have to be adopted, in 1947 more

than 400 inexperienced operators applied anhydrous ammonia to 200,000 acres of maize and cotton without any serious accident occurring.

A note in *The American Fertilizer* for April 17, 1948, states that the U.S. Army plans to lease the Cactus Ordnance Works at Etter, Texas, for the production of anhydrous ammonia. The compressors were recently destroyed by fire, but it is hoped that full production, about 6,000 tons of anhydrous ammonia monthly, will be restored in July.

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- (5) Forde, H. I. and Proebsting, E. L. *Hilgardia* 16, 1945 (411-425).
- (6) *Idaho Agric. Expt. Sta. Report* 1937, Bull. 225, 1938, pp. 68.
- (7) Jackson, M. L. and Chang, S. C. *J. Amer. Soc. Agron.* 39, 1947 (623-633).
- (8) Jenny, H., Ayers, A. D. and Hosking, J. S. *Hilgardia* 16, 1945 (429-457).
- (9) Shell Development Company and C. B. de Bruyn. *U.S. Patent* No. 2,020,824. Applied for, 1934.
- (10) Shell Development Company and F. H. Leavitt. *U.S. Patent* No. 2,285,932. Applied for, 1939.
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SUMMARY OF REPORTS

Reports received include: *Canada*, Report of the Minister of Agriculture, *Ontario* 1946-47; *Rapport du Ministre de l'Agriculture, Quebec* 1946; Report of Department of Agriculture, *Saskatchewan* 1946-47; *Ceylon*, Coconut Research Scheme Report 1944; *Cyprus*, Department of Agriculture Report 1946; *France*, Recherches sur la fertilisation effectuées par les Stations Agronomiques 1945-46; *Kenya*, Department of Agriculture Report 1946; *Malaya*, Rubber Research Institute Report 1940 (published 1947); *Scotland*, Macaulay Institute for Soil Research Report 1946-47; *South Africa*, Council for Scientific and Industrial Research Report 1946-47; Department of Agriculture Report 1946-47; *Sudan*, Report of Government Analyst, Wellcome Chemical Laboratories, Khartoum, 1945 and 1946; *Tanganyika Territory*, Department of Agriculture Report 1945; Forestry Department Report 1945; *Trinidad and Tobago*, Report of Director of Agriculture 1946; *Uganda*, Department of Agriculture Report 1945-46 (Administrative); *West African Cacao Research Institute*, Tafo, Quarterly Report Oct.-Dec. 1947; *Zanzibar*, Report of Director of Agriculture 1946; *United States Agricultural Experiment Stations: Colorado*, 1946-47; *Georgia*, 1946-47; *Puerto Rico*, 1946; *Texas*, 1946; *Washington*, 1946.

Canada. Ontario.—*Fertilizers*. NH_4NO_3 as top dressing for winter wheat. K fertilizers for potatoes, and their effect on incidence of scab. Effect on crops of the source of K with and without Mg. *Methods of application* on wheat, on ploughsole and in the row with fertilizer-grain drill. Effect of applying P to limed and unlimed clay soil deficient in lime and P. *Soil fertility and lodging of grain*. The use of mineral fertilizers supplying more than the usual amounts of P and K, drilled with the seed, has reduced lodging in spring grain. The rotation practised, amount of manure applied before the grain crop, and ploughing in of legumes all affected lodging. *Fertilizers for peas*: Effect of nature of preceding crops and their manuring, weeds, level of soil fertility and amount of farmyard manure applied.

Quebec.—Weed eradication with CuSO_4 and NaClO_3 . Establishment of new *Soils Division* for classification, analysis and conservation of soils.

Ceylon.—Influence of manuring on flower development and setting of coconuts.

Cyprus.—Trials with *fertilizers and fallows*: Comparison of yield of wheat after grazed *Vicia sativa* and after bare fallow. *Fertilizers for potatoes* which in Cyprus respond to N and P, but not to K.

France. Blois.—Rate of decomposition in soil of lucerne, straw, leaves and peat. Determination of the water content of a loam soil. *Fertilizers*: Residual value of P and K. Fertilizers for apple trees and N fertilizers for asparagus. Use of fertilizer lance for pear trees. Application of the NH_4 -oxalate method for extracting humus.

Chartres.—Comparison of methods for determining the humus content of soils. Effect of NPK on lucerne and on soil exhaustion. Comparison of manure, green manure, straw and peat on wheat and oats.

Chateauroux.—Effect of temperature on the interaction of humus and ammonium oxalate.

Montpellier.—Effects of growing vetch and oats under fruit trees.

Rouen.—Fertilizer-lance experiments. Reaction of weeds to 2,4-D.

Versailles.—*Lysimetric studies* in soils under fallow and cultivation and treated with chopped straw, peat and humic acid extracted from lignite. *Fixation of P* in loam soils, relationship between adsorption of phosphates on clays and the concentration of flocculating salt. Decomposition of peat with and without addition of urea, NPK or citric acid. *Colloidal properties of humic acids* extracted from peat, lignite, compost and liquid manure. *K-deficiency disease of apple trees*. Analysis of *Madagascar laterites*.

Kenya.—*Soil survey* and land-utilization surveys. Manufacture of silico-phosphate by calcining Uganda rock phosphate with Magadi ash. Trials with silico-phosphate and Uganda rock phosphate on rotations of maize, soybeans, millet, ground-nuts, beans, sweet potatoes, cassava and grass. *Coffee*: Soil-moisture measurement. *Pyrethrum*: Fertilizing with P and Ca; mulching. Green-manuring for rice and its effect on rice blast.

Malaya.—*Manuring* of mature and immature rubber trees. *Cover crops*. *Composts* using oil-palm bunch refuse mixed with *Mikonia* cuttings in proportion 2 : 1.

Scotland. Macaulay Institute.—*Fertilizers*: Phosphate relationships and effects of different forms of phosphates; Fertilizer placement for cereals and roots; Fertilizers for forest nurseries. *Soil survey*. Composition of clay minerals. *Chemical investigations*: Isolation, purification and characterization of the major constituents of soil humus complexes of different origins; chemistry of soil polysaccharides and of carbohydrate mucilages synthesized by soil bacteria, both in compost and *in vitro*; the more soluble N compounds in soil. *Microbiological investigations*; decomposition of organic matter in composts. *Spectrographic analyses* of trace constituents in soils and plants.

South African Council for Scientific and Industrial Research.—*Swelling and shrinkage of soils* and their effect on the upward movement of buildings. Design and construction of instrument for measuring soil pressures.

South Africa. Government Guano Islands.—*Grapes*: Effect of NPK fertilizers and irrigation; effect of $(\text{NH}_4)_2\text{SO}_4$ and kraal manure applied at various depths. Rate of nitrification of cover crops, raw materials and fertilizers. Mulching experiments; effect on water penetration and soil temperature. Soil-moisture requirements and time of irrigation.

Potchefstroom.—Effect of poor and irregular rainfall on fertilizer experiments.

Pretoria.—*Soil survey*. *Fertilizers* for dryland and irrigated areas. Ammonia and nitrate N for citrus and vegetables. C/N balance and base-exchange studies. Foliar diagnosis on citrus; effect of N fertilizers on vitamin-C content; importance of trace elements. *Fertilizers* for maize in rotation with legumes and other hay crops, and for veld, pineapple and deciduous fruits. Rotations with Rhodes grass and cowpeas; mutual competition between Rhodes grass and lucerne. Effect of lucerne on subsequent crops and on productivity and structure of soil. Value of lucerne for suppressing weeds. Residual effect on maize of heavy applications of kraal manure and super. once in 5 years. Residual effect of lime on dryland crops. *Physical properties*. *Humus content of soil* influenced by cultivation, fertility, crop rotation and a grass crop. Effect of time of ploughing and number of ploughings on a crop in rotation. Influence of grass and other crops on nitrification in soil. Influence of fallowing on soil moisture. *Insecticides*. Tests on stability of pentachlorophenol in soils.

Rustenburg.—Effect of DDT and CS_2 on eekworm in tobacco. *Fertilizers for maize*; green manuring with sunn hemp.

Stellenbosch-Elsenberg.—Fertilizers for different rotations, especially with wheat. Phosphate fixation in soils in the winter-rainfall area. Mn absorption, and methods of application of Mn in soils of the Cape Flats. Determination of assimilation of N from fertilizers.

Upington.—*Improvement of brackish soils* by mixing soil layers and applying NPK, farm manure and compost. Rotations of maize and soybeans with wheat.

Vaal Lartz.—Harmful effect of Sudan grass on following crop.

Tanganyika Territory Department of Agriculture.—Comparison of various indigenous cultivation systems; tests with rates and methods of applying kraal manure. *Fertilizers and rotations for millet and cotton*. Green-manuring of millet. *Fertilizers for sisal*. Manuring of black and red soils. Effect of a fallow year and green manure. *Wheat*:

Deep cultivation, after-cultivation, ploughing-in stubble, fertilizing with $(\text{NH}_4)_2\text{SO}_4$ before and after sowing; green-manuring with sunflower, sunn hemp and buckwheat.

Trinidad and Tobago.—*Cacao*: Surface mulch with and without added fertilizers for established old trees. *Sugar cane*: P and N fertilizers. Rotation experiments for control of *bacterial wilt of tomato*. Manuring of *pawpaw*. Rapid determination of Al in the presence of excess Fe.

West African Cacao Research Institute, Tafo.—*Soil surveys* in Northern Territories and Ashanti in connexion with the proposed groundnut scheme for West Africa.

Zanzibar.—*Fertilizers*: Trials with neutral silicophosphates for cloves. Trials with coconut-meal compost and $(\text{NH}_4)_2\text{SO}_4$ for clove saplings. Coconut meal and NPK fertilizers for coconuts; $(\text{NH}_4)_2\text{SO}_4$ coconut meal and compost for cacao; coconut meal and lime for rice. Rotations for rice.

United States Experiment Stations

Colorado.—Effect of permeability and dispersion of *saline soils* on their suitability for irrigation and reclamation. Classification of saline soils. Crop rotations with and without lucerne. *Fertilizers* for potatoes; effect of N, P, K, Cu, Fe and Mn on pH, salts, mechanical analysis and soil nitrate. Application of trace elements to soils growing chlorotic peach trees.

Georgia.—*Fertilizers* for cotton, small grains, peanuts, maize and pasture. Sulphur

for cotton. K and B for lucerne. Fertilizer treatments for black locust and pine seedlings.

Puerto Rico.—Effect of *mulching* on soil temperatures and weeds. *Cinchona*: Soil moisture and propagation of seedlings. *Soil fumigation* with chloropicrin in cinchona nurseries. *Vanilla*: Effect of deficiency of N, P, K, Mg and Ca on growth and fruiting; effect of pH of soil on growth and survival; effect of shade. *Green ginger*: Effect of manure, commercial fertilizer, leaf mould and compost on yield. *Kudzu* for soil erosion control. Effect of 2,4-D on *nutgrass*.

Texas.—*Rice*: Control of weeds by application of 2,4-D from the air, various N fertilizers and different rates and times of application. *Rotations with grain sorghum*, and effect of sorghums on wheat, oats and barley. *Legumes for soil improvement* in rotations with cotton and maize. *Fertilizers*: N for small grains; P for lucerne; fertilizers for cotton and maize; $(\text{NH}_4)_2\text{SO}_4$ and NH_4NO_3 in liquid form for tomato; P fertilizers on legumes on Blacklands. Comparison of super. and rock phosphate for grassland.

Washington.—*Fertilizers* for forage grasses, legumes and potatoes. Maintenance of organic matter by applying manure, $(\text{NH}_4)_2\text{SO}_4$ and straw. Modified CO_2 -extraction method for phosphate.

Effect of various crops on *fungus flora of soil*. *Orchard soils*: Toxicity studies with As; cover crops and fertilizers; chemical control of weeds.

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages. Where the Bureau has only seen an abstract, and not the original paper, no language indication is given.

Original (untranslated) titles of papers are only given where the Latin script is used.

Where more than one reference is given, the first is to the original paper, the others to notices in abstract journals. A key to the abbreviations used in the references is contained in the Bureau's *Bibliography of Soil Science, Fertilizers and General Agronomy*.

551.5 METEOROLOGY

[747] 551.577.53
BRUN, E.; DEMON, L. Sur la formation artificielle de la pluie. [On the formation of artificial rain.] C.R. 226, 1948 (589-590). [F.]

Rain was produced by the release from an aeroplane of carbonic snow capsules which exploded above the clouds.

631.3 AGRICULTURAL EQUIPMENT

(See also Abs. Nos. 809, 1006, 1007, 1008, 1009).

[748] 631.347.24 : 634
McCULLOCH, A. W. Engineering design for sprinkler irrigation. Proc. Wash. St. Hort. Assoc. 1946, 1947 (251-271).

Sprinkler irrigation of hillside orchards is the best form for soil and water conservation. The intake rate and moisture-holding capacities of the soil must be considered in the engineering design for sprinkler irrigation, and are tabulated for typical soils.

631.4 SOILS

[749] 631.4
BRADFIELD, R. Where are the new discoveries in soil science leading? I. The physical chemistry of soil-plant relationships. Proc. Soil Sci. Soc. Amer. 1946, 11, 1947 (3-8). [Cornell Univ., Ithaca]

A plea is made for the conservation of fertilizer resources by exploring means for utilizing more fully the vast, untapped nutrient reserves of the topsoil and subsoil. Most problems in applied soil science are now so involved and require such a high

degree of specialization that it is virtually impossible to tackle them except by organized research teams. Much of the literature of soil science is fragmentary, and it is becoming increasingly difficult to trace the relationship of the various fragments to each other.

[750] 631.4
OGG, W. G. Soil and the farmer. J. Farm. Club, Pt. 2, 1948 (14-27).
Popular lecture with discussion.

[751] 631.4 : 551.311.33
DOBZANSKI, B. Studia gleboznawcze nad lessami północnej krawędzi Podolia. [Pedological investigations of loess on the northern margin of Podolia.] Roczn. Univ. Marii Curie-Skłodowskiej 1, No. 2, Sect. E, 1947, pp. 59. [Pl.e.]

Loess soils are classified as normal, sandy and loamy loess. The loamy loesses are subdivided into carbonate and non-carbonate soils. The three classes differ in physical, chemical and absorptive properties. Normal loess contains 25-32%, loamy loess 36-40%, and sandy loess more than 20%, of particles <0.01 mm. diameter. Agriculturally, the best soils are the normal loess, and the worst the loamy loess which are podzolized and have a low permeability.

631.41 SOIL CHEMISTRY

(See also Abs. Nos. 765, 774, 783, 784, 823, 845, 859, 888, 901, 1033).

[752] 631.412 : 541.128
IYER, C. R. H. ; SUBRAHMANYAN, V. Production of more food from soil. Indian Farm. 7, 1946 (523-524).

Soil can be catalysed to give 25% increase in yield by using small quantities of KMnO_4 , Fe and Mn oxides and soluble salts of Fe and Mn mixed with organic manure or compost. 14 lb./acre of sulphate of Fe or Mn is sufficient.

[753] 631.413.1 : 631.821.1
MILES, I. E. Available calcium supply in poorly buffered soils. *Soil Sci.* 65, 1948 (97-102). [N.C. St. Dept. Agric.]

The coastal-plain soils of North Carolina are mainly coarse-textured sandy loams, low in organic matter and of poor to medium Ca content, with a cation-exchange capacity averaging less than 4 m.e. Their colloidal complex is largely of the kaolinitic and organic type, the Ca of which is readily available. In these soils, therefore, only small amounts of lime are needed to effect the desired degree of saturation.

[754] 631.414.04
PETERSON, J. B. Water stability of bentonite films. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (53-56). [Iowa Agric. Expt. Sta., Ames]

The relative water stability of films formed by drying variously treated suspensions of bentonite clay on glass slides was determined and compared with several rheological properties of the suspensions, including apparent viscosity and yield-point data.

The order of effectiveness of cations in increasing the water stability of films was $\text{H} > \text{Ca} > \text{Na}$. Differences in effect of gelatin and pectin on water stability were not apparent, but rheological properties revealed stronger structural properties for gelatin systems than for pectin systems, which were stronger than for non-organic systems.

Both gelatin and pectin with the various homoionic clays produced effects on rheological properties indicating strong interaction between the organic materials and the clays, the interaction being much greater with gelatin than with pectin.—From author's summary.

[755] 631.414.1
LANE, K. S.; WASHBURN, D. E. Capillary tests by capillarimeter and by soil-filled tubes. *Highway Res. Bd. Proc.* 26, 1946 (460-473). C.A. 42 (1003).

The rates of capillary rise in open-tube soil tests did not agree with those calculated from the theoretical equation.

[756] 631.414.2
NIKIFOROFF, C. C.; HUMBERT, R. P.; CADY, J. G. The hardpan in certain soils of the Coastal Plain. *Soil Sci.* 65, 1948 (135-153). [U.S.D.A.]

The hardpans of the Leonardtown series are compacted and uncemented, and represent a type of formation fundamentally different from the chemically cemented hardpans. Laboratory and electron-microscope investigations suggest that the hardpan and upper horizons of the soil were developed from different materials. It is concluded that the formation of this hardpan antedated deposition of the sediments from which the upper horizons of the soil developed. The lower layer was laid down by water, whereas the upper layer might have been spread by either water or wind. An abrupt boundary between these layers coincides with the surface of the hardpan. This lower profile consists of uncemented "physical," as distinguished from a pedogenic, hardpan. The hardness of this pan is largely due to the dense packing of its primary particles.

[757] 631.414.2 : 537.531
WHITE, J. L.; JACKSON, M. L. Glycerol solvation of soil clays for X-ray diffraction analysis. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (150-154).

The direct addition of glycerol to a water suspension of a Ca clay gave more satisfactory patterns than a Na clay, but the pattern-line intensities were less than the maximum found by controlled hydration. The addition of glycerol in a ternary solution (glycerol-ethanol-benzene) made possible a variation in spacing from 15-18A, and the maximum intensities found were about equal to those obtained with controlled hydration. Different clays required different concentrations of glycerol for maximum intensity of pattern. The glycerol method is less satisfactory in differentiating between the montmorillonite group and some hydrous micas.

[758] 631.414.2 : 537.531
MICHARD, R. La différenciation de l'illite et de l'attapulgitite sur les diagrammes aux rayons X des fractions argileuses des sols. [Differentiation of illite and attapulgitite on X-ray diagrams of the clay fractions of soils.] *C.R.* 226, 1948 (346-347). [F.]

Differentiation of illite and attapulgite on X-ray diffraction diagrams is difficult in agricultural soils containing a mixture of the two minerals with a low attapulgite content. Examination of synthetic mixtures of varying proportions of pure attapulgite and illite shows that by the usual method it is impossible to detect less than 15% of attapulgite. Sensitivity may be increased by separating the 10A lines into two constituents by operating with a horizontal rather than a vertical layer of clay, the sedimentation planes being parallel to the equatorial line of the diagram. The short illite arc is transferred to the poles of the diagram and does not mask the elongated attapulgite arc on the equator of the diagram. 5% attapulgite may be detected by this method.

[759] 631.414.2 : 549
ALBAREDA HERRERA, J. M.; ALEIXANDRE FERRANDIS, V. Sobre la aditividad en las deshidrataciones de mezclas de los minerales de la arcilla. [Additivity in the dehydration of mixtures of clay minerals.] *An. Inst. Esp. Edafol.* 6, 1947 (603-631). [Sp.f.e.]

Study of the dehydration curves of augite, andalusite, kaolin, feldspar, limonite and aluminium hydroxide and of mixtures of these minerals indicates that (1) the dehydration of mixtures is almost exactly additive and (2) the presence of 5-10% of kaolin could always be traced except in mixtures containing high proportions of aluminium hydroxide.

[760] 631.414.2 : 549.1
HÉNIN, S.; DUPUIS, J. La pectrographie, méthode nouvelle d'identification des attapulgites. [Petrography, a new method for identifying attapulgites.] *Ann. Agron.* 17, 1947 (658-666). [F.] [Lab. Sols, Versailles]

The petrographic method of analysing clays was studied with special reference to attapulgite. The deposit was prepared by submerging a glass slide obliquely in a 1-2 p.p. thousand suspension of freshly extracted clay with a maximum diameter of 1 μ . NH_3 was used as a dispersing agent. The suspension was then evaporated gently at 50-60°C. to prevent flocculation. The deposits consisted of fairly compact, parallel fibres which were birefringent under polarized light. Investigations of mixed suspensions of

attapulgite and montmorillonite or kaolinite showed that at least 75% of attapulgite must be present to give a characteristic deposit. Although only positive results can be considered, as certain undisputed attapulgites do not give characteristic deposits, it is concluded that petrography shows promise as a means of diagnosis.

[761] 631.414.2 : 549.623.93/4
CAILLÈRE, S.; HÉNIN, S.; MÉRIAUX, S. Transformation expérimentale d'une montmorillonite en une phyllite à 10A type illite. [Experimental transformation of a montmorillonite into a phyllite of the 10A illite type.] *C.R.* 226, 1948 (680-681). [F.]

After repeated boiling for 8 hours with n. KOH and drying, a montmorillonite behaved similarly to illite with respect to X-ray diffraction, treatment with Ca salts and thermal properties.

[762] 631.414.2.025
ALBAREDA HERRERA, J. M.; RODRIGUEZ MUÑOZ, C. Fenómenos de ordenación y reoanotropía de arcillas. [Phenomena of orientation and anisotropy of flow in clays.] *An. Inst. Esp. Edafol.* 6, 1947 (475-541). [Sp.e.]

A detailed discussion of the formation of oriented deposits by the evaporation of clay suspensions in water or hydrophile liquids, the different behaviour of the deposits with respect to hydro- and lipophile liquids, the streaming birefringence caused by the addition of liquids which reduce the surface tension of the aqueous suspensions, the flotation phenomena especially noticeable with reddish and yellow clays and the connexion between thixotropy and anisotropy of flow.

[763] 631.414.323 : 549.623.9
SIELING, D. H. Role of kaolin in anion sorption and exchange. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (161-170).

The anion-sorption capacity of kaolin increases on ballmilling or heating with alkali. The active constituent is probably a hydrous alumina such as $\gamma\text{-AlOOH}$, and is removed by extracting with 0.1 n. HCl, 0.1 M tartaric acid or 10% HCl. The alumina of ballmilled kaolin sorbed PO_4 and AsO_4 in nearly equivalent amounts from dilute

solutions, but far more AsO_4 from concentrated solutions, while the amount of either anion sorbed varied inversely with the pH of the equilibrium solution and directly with the initial concentration. PO_4 replaced sorbed AsO_4 from the alumina of ballmilled clay, but not equivalently, while AsO_4 replaced a very small percentage of the PO_4 present. Arsenate is unsuitable for measuring anion sorption or exchangeable P in soils.

[764] 631.414.324 : 549
TEICHNER, S. Emplacement des ions échangeables dans la montmorillonite. [The location of exchangeable ions in montmorillonite.] *C.R.* 225, 1947 (1337-1339). [F.]

The desorption under vacuum of the adsorbed water of a natural (Ca) and a prepared Na montmorillonite was studied (1) at 180°C., at which temperature all water except that of constitution was progressively lost, and (2) at room temperature, when the Ca form retained 3 molecules of adsorbed water per exchangeable Ca ion, whereas the Na form retained only one molecule per Na ion. Determination of the N-adsorption isotherm at -195°C. and thus of the specific surfaces of the two forms after desorption at 20 and 180°C., indicated that the Na ions are situated on the external surface of the elementary particles formed by the juxtaposition of laminae, whereas the Ca ions are on the internal surfaces between the laminae.

[765] 631.415.1 : 545.372 : 549.67 : 631.416.7
MARSHALL, C. E.; AYERS, A. D. Clay membrane electrodes for determining calcium activities. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (171-174).

The Ca/Mg, Ca/K and Ca/H mobility ratios obtained with 615°C. Ca-bentonite and Ca-Putnam membranes using various concentrations of solution, and the use of mobility ratios in determining Ca-ion activity are briefly discussed. Studies of Ca-ion activities in Putnam clay suspensions indicate that, in contrast with Na, the pH is not a sensitive function of the clay concentration. The fraction active for Ca reached a minimum of 0.4% at 50 m.e. of base per 100 gm. of clay. Preliminary results with bentonite show that electrochemically it resembles Putnam clay, displaying a broad region in which Ca additions cause little change in Ca-ion activity. The fraction active for Ca reaches

a minimum at 0.9% and thus, for the cations, H, Na, NH_4 , K and Ca the bentonite (montmorillonite) is more ionized than the Putnam (beidellite). With kaolinite the active fraction ranges from 10 to 20%, and thus the ratio ionization of monovalent/ionization of divalent cation is much less than for the expanding-lattice clays, and both types of cation are much more extensively dissociated from kaolinite than from the latter.

[766] 631.415.1 : 620.19
POWERS, W. L. Durability of concrete drain pipe. *Agric. Engng.* 29, 1948 (77). [Oreg. Expt. Sta.]

It has been verified that exposure of concrete pipes to acid, alkaline or saline soils results in considerable corrosion. For wet soils of nearly neutral reaction concrete tile may be substituted for good burnt-clay tile. The sulphate type of soil is especially hazardous.

[767] 631.415.1 : 631.417.2 : 061.6
YU, H. [Some relationships between soil reaction and colour intensity of humus.] *Soils Quart.* 4, 1945 (35-38). C.A. 42 (1002).

[768] 631.415.1.005
BATES, R. G. Definitions of pH scales. *Chem. Revs.* 42, 1948 (1-61). [Nat. Bureau Standards, Washington, D.C.]

In view of the numbers of pH scales used, all published pH values should be accompanied by a statement of the type of cell measured, of the standard potential used in computing the results and of whether an attempt was made to eliminate the liquid-junction potential or to correct the electromotive force. When the pH meter is used, the pH values of the standard-reference solutions with which the instrument was calibrated, should be stated.

[769] 631.415.36
UNITED STATES REGIONAL SALINITY LABORATORY. Diagnosis and improvement of saline and alkali soils. U.S.D.A. *Bur. Pl. Indust.* 1947, pp. 157.

An excellent summary of the general nature of the problem, including information on the origin and nature of saline and alkali soils, effects on crops, types of information

required for diagnosis, and principles and practices of reclamation. Methods for making tests and analyses are given in a separate section.

[770] 631.415.36 : 546.22
POWERS, W. L. **Reclamation and use of alkali soils.** *Oreg. Agric. Expt. Sta. Bull.* 10, 1946, pp. 31.

Of the 300,000 acres of salt-infected land in Oregon, 1/3 has a good climate with facilities for water control for land improvement. Saline lands can be reclaimed by deep drainage to 7-11 feet or more and by copious irrigation with water of good quality containing S or gypsum. Reclamation of black alkali requires chemical treatment with 500-1500 lb./acre of S and liberal applications of organic matter. Less S is required where barnyard manure is used. Alum and gypsum are less effective than S. In preparing a seed bed it is better to disc in organic matter and use surface cultivation rather than to plough.

Reclaimed plots have lost up to 92% of their total salts, 88% of their initial black alkali content to a depth of 20 inches, and most of the excess neutral salts. Soil-organic matter, N, base-exchange capacity and moisture equivalent have been increased significantly and structure, colour and absorptiveness have improved.

[771] 631.416 : 631.415.1
TRUOG, E. **Lime in relation to availability of plant nutrients.** *Soil Sci.* 65, 1948 (1-7).

An outline discussion, based on a modified Pettinger availability-pH chart, of the relationship between soil pH and the availability of N, P, S, K, Ca, Mg, Mn, Fe, B, Cu and Zn in soils.

[772] 631.416.13 : 581.192
GILBERT, C. S. ; EPPSON, H. F. ; BRADLEY, W. B., ET AL. **Nitrate accumulation in cultivated plants and weeds.** *Wyo. Agric. Expt. Sta. Bull.* 277, 1946, pp. 39.

Many plants in Wyoming contain toxic amounts of KNO_3 . High available N in the soil increases the nitrate N in plants although the N content of the plants does not seem to be directly correlated with either the nitrate N or total N of the soil. In the presence of small amounts of available N in the soil,

P decreases the nitrate N in plants, but in the presence of large amounts, P has little effect. Soils derived from limy shales induce greater storage of nitrate than sandy loam soils. Reduction of light due to shading in narrow valleys may cause high nitrate in plants. Nitrate storage does not seem to be affected by forms of N used as fertilizer, temperature, continuous drought or traces of B, Mn or Mo.

[773] 631.416.2
TOMMASI, G. ; MARIMPIETRI, L. [**Phosphorus: the principal factor in crop yield.**] *Ann. Sper. Agrar.* 40, 1941 (209-276). B.A. BIII, 1947 (199). [I.]

A method of determining P_2O_5 requirement of soil is described. With acid types, a high humus content corresponds to high P requirement and high P fixation; the reverse is true in sweeter soils. Podzols have low P contents, and little capacity for P fixation. In general there is no relation between total and assimilable P_2O_5 nor between either of these values and capacity for P fixation.

[774] 631.416.2 : 631.414.3
BURD, J. S. **Chemistry of the phosphate ion in soil systems.** *Soil Sci.* 65, 1948 (227-247). [Calif. Agric. Expt. Sta.]

A study of solutions obtained from soils by the displacement procedure indicates that a decrease in the Ca concentration of the soil solution causes an increase of the PO_4 concentration in the liquid phase, and a tendency to an increase of PO_4 in the root-surface interphase.

In soils in which phosphate solubility is dominated by Ca, namely those with considerable exchangeable Ca and limited kaolinite and/or Fe and Al oxides, the quantity of PO_4 present in an equilibrium solution with dilute acid is less than that present when the time of contact between soil and reacting solution is brief. A "contact-equilibrium" procedure, involving contact for 10 seconds, more nearly simulates conditions in the particle-solution-root interphases. With many soils of known P requirement, contact-equilibrium extraction, using a wide solution/soil ratio, showed little correlation between extractable PO_4 and the known P requirement (determined by pot experiments with oats), but the water

extracts showed a high degree of correlation, suggesting that the absorption of PO_4 by roots is largely conditioned by Ca fluctuations in the interphase, caused by the roots' absorption of Ca, a view supported by the fact that on displacing the soils, the second increment of solutions obtained (1) never and (2) always gave substantial increases in PO_4 concentration over the first increment in the soils which were physiologically (1) defective and (2) adequate in P.

The influence of such plant-induced shifts in the equilibrium appears to be small in organic soils.

[775] 631.416.2 : 631.414.3 : 549.623.9
PERKINS, A. T. **Kaolin and treated kaolins and their relations.** *Soil Sci.* 65, 1948 (185-191). [Kansas St. Coll.]

Samples of kaolin passing a 100-mesh sieve were (1) retained in its original condition, (2) heated overnight at 700°C ., (3) ball-milled for 10 days, and (4) mortar-ground for 48 hours. Heating eliminated about 13% by weight of water, and increased particle size, phosphate fixation and alkalinity. It did not change the base-exchange capacity. Grinding and ball-milling increased base-exchange capacity, phosphate fixation and alkalinity. The increase in phosphate fixation was attributed to removal of OH groups. The effect of grinding on base-exchange capacity was much greater than that of heating. This is interpreted to mean that base exchange is a function of surface area, whereas phosphate fixation is a function of both surface area and OH groups.

[776] 631.416.2 : 631.417
PIERRE, W. H. **The phosphorus cycle and soil fertility.** *J. Amer. Soc. Agron.* 40, 1948 (1-14).

A sketch of some of the important phases of the P cycle, with special reference to the type and properties of the organic-P compounds in soils and the effect of micro-organisms and soil-management practices on the availability of P.

[777] 631.416.2 : 631.461
GERRETSEN, F. C. **The influence of micro-organisms on the phosphate intake by the plant.** *Plant and Soil* 1, 1948 (51-81). [E.] [Agric. Expt. Sta., Groningen]

Oats, mustard and sunflower were grown in sterilized sand and soil to which KNO_3 ,

$\text{Ca}(\text{NO}_3)_2$ and P, using as sources CaHPO_4 , $\text{Ca}_3(\text{PO}_4)_2$, bonemeal, Moroccan and Algerian phosphate and, in some cases, KH_2PO_4 as a standard, were added. The pots were then inoculated with 1% of fertile soil or with pure cultures of rhizosphere bacteria. Although some absorption of P took place in the sterile controls, inoculation resulted in considerable increases in the amounts of P absorbed by the plants. The total increase in weight of dry matter was negligible, however, suggesting that there was no favourable bacterial activity apart from solubilization of the phosphates. In one case the weight of inoculated mustard plants was smaller than that of the sterile controls; this was traced to Fe chlorosis due to precipitation of Fe by the solubilized phosphate, and indicated the influence of microbes on the phosphate-iron equilibrium. Visual evidence of the solvent action of the micro-organisms was obtained by burying in the culture pots tilted glass plates covered with an agar film in which CaHPO_4 was precipitated. Clear solubilization zones were scattered at random over the plates in inoculated but not in sterile soils. Electrometric pH determination showed very little differences in value between the sterile and inoculated soils.

[778] 631.416.2 : 631.85 : 525.5
REYNOLDS, E. B.; SMITH, J. C. **The effect of fertilizer treatments and dates of sampling on the easily soluble phosphorus in soil.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (198-200).

In plots under cotton and treated with fertilizer containing super., and with or without vetch as a green manure, the easily soluble P_2O_5 content in p.p.m. of soil during the period May to September increased from 5.0 to 6.7 in 1937, remained at about 8.0 in 1938, decreased from 25.5 to 16.6 in 1939, and from 14.8 to 11.8 in 1940. The ploughing-under of unfertilized vetch did not increase the easily soluble P_2O_5 . The corresponding figures for fallowed plots showed highly significant differences in comparison with the cotton plots and in respect of season and year of sampling. In 1946, plots under maize receiving only the residual value of the various treatments applied to the preceding cotton crop showed significant variations of easily soluble P_2O_5 in respect of both season of sampling and treatment.

[779] 63I.416.323
LAKIN, H. W. ; BYERS, H. G. **Selenium occurrence in certain soils in the United States, with a discussion of related topics : seventh report.** *U.S.D.A. Tech. Bull.* 950, 1948, pp. 36.

The major part of this report is concerned with seleniferous soils derived from glacial, lacustrine and recent alluvial materials. The Se content and other data on 324 samples of soils, minerals and vegetation are tabulated.

[780] 63I.416.4 : 55I.577
BERTRAND, G. Sur une démonstration par voie biologique de l'existence du magnésium et du potassium dans l'eau de pluie. [On a demonstration by biological means of the existence of magnesium and potassium in rain water.] *Ann. Agron.* 17, 1947 (639-642) and *Ann. Inst. Pasteur* 73, 1947 (1186-1190). [F.]

12-c.c. samples of rain water were decanted into plugged, fused-quartz tubes and inoculated with a green alga. After some weeks a growth was visible, and after 2-3 months a lens-shaped mass, $\frac{1}{2}$ cm. in diameter, had formed at the base of the tube. No growth occurred in the distilled-water control. An effect similar to that given by rain water was obtained by introducing a small quantity of yeast ash to the distilled water. The experiment was repeated on a larger scale and the algae harvested, weighed and analysed. The growth of the algae and the results of analyses are put forward as proof of the presence of Mg and K in rain water.

[781] 63I.416.4 : 63I.414.3 : 549
RANEY, W. A. ; HOOVER, C. D. **The release of artificially fixed potassium from a kaolinitic and a montmorillonitic soil.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (231-237).

23% of the 2160 p.p.m. of K applied to a soil (a) whose fine clay-mineral fraction was mainly montmorillonitic, was fixed during 1 month of moist storage, and 57% when the soil was air-dried after storage and before leaching with neutral n. ammonium acetate. K fixation in kaolinitic soil (b) was small, especially on drying after storage.

Frequency-of-leaching experiments indicated that in (a) a temporary equilibrium between exchangeable and non-exchangeable K was reached in 1 week after leaching, and

a second equilibrium level in 1 month, whereas the only equilibrium level in (b) occurred in nearly 2 weeks.

Ca-saturated soils containing small, medium and large quantities of artificially fixed K released respectively greater, similar or smaller quantities of K into the exchangeable form than the same soils when H-saturated.

[782] 63I.416.4 : 63I.414.3 : 63I.416.11
STANFORD, G. ; PIERRE, W. H. **The relation of potassium fixation to ammonium fixation.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (155-160).

In loams, silt loams and silty clay loams, all moist and of pH values 4.8-7.5, K- and NH_4 -fixing capacities were significantly correlated when the ions were supplied in equivalent amounts. The K or NH_4 which was fixed by soil samples containing different levels of previously fixed NH_4 or K, respectively, varied inversely with this previously fixed cation content. It is concluded that K and NH_4 ions are fixed by the same mechanism.

Acid or NH_4 -acetate extraction removed the capacity of calcareous Webster soils to fix K, probably due to the fixation of H in non-exchangeable form.

[783] 63I.416.7 : 63I.414.3 : 549
MARSHALL, C. E. **Ionization of calcium from soil colloids and its bearing on soil-plant relationships.** *Soil Sci.* 65, 1948 (57-68). [Missouri Agric. Expt. Sta.]

The titration curves of beidellite, montmorillonite and kaolinite with NaOH and $\text{Ca}(\text{OH})_2$ indicate that in the first two clays the ionized fraction of the added base varies abruptly for Na and Ca at different stages, whereas the ionized fraction in kaolinite rises steadily and is much larger, especially for Ca. In montmorillonite, below 70% Ca saturation, Ca exchange against hydrogen is comparatively difficult, and thus a given addition of lime to a kaolinitic or montmorillonitic soil may induce a large or small crop response respectively.

[784] 63I.416.8 : 544.6
MITCHELL, R. L. **Trace constituents in soils and plants. Their significance and spectrographic determination.** *Research* 1, 1948 (159-165). [Macaulay Inst., Aberdeen]

Trace constituents differ in igneous rocks in passing from ultrabasic to acid rocks. Geochemical rules governing the distribution of trace constituents in sediments are more complex, and dissolution and precipitation, oxidation and reduction, hydrolysis and carbonation must be considered. Trace-element contents of some cultivated soils of different geological origin show, e.g., that an inherent deficiency of Co is not to be expected in soils derived from basic igneous rocks.

For many elements availability is related to soil acidity. The greater the acidity the greater is the uptake of Co by the plant; in neutral or alkaline soils, Co deficiency in stock may occur where the Co status would be adequate at pH 5-6. Lime increases the uptake of Mo and decreases that of Co and Ni. Deficiency of Mn and B occur in neutral or alkaline soils, even if the soil itself is not deficient.

The problem of determining the amount of a trace element available to the plant has not yet been solved satisfactorily. Extraction with dilute acetic acid gives a reasonable indication of the Co status of a soil of moderate acidity. A soil content of 0.05 p.p.m. of Co soluble in 2.5% acetic acid is adequate in Scotland. 'Pining' in animals can be prevented by soil treatment with 2 lb./acre of Co salt.

Where several elements in the same sample are to be determined, spectrographic technique is the most convenient. Up to 15 trace constituents in soil extracts and plant materials can be determined simultaneously by a variable internal standard cathode-layer carbon-arc method. This method and a simpler semi-qualitative method giving an accuracy of ± 30 -40% of the amount present are described.

[785] 63I.416.856
VOGT, T.; BERGH, H. **Geochemical and geobotanical methods for ore prospecting. X. Determination of copper in soil samples.** *Kgl. Norske Vidensk. Selsk. Forh.* 19, No. 21, 1946 (76-79). C.A. 42 (493).

Soil containing humus can bind large quantities of Cu and other heavy metals. The soil examined generally contained 20 mg./kg. of Cu. Some samples contained 500-7000 mg./kg.

[786] 63I.416.856 : 63I.417
HURWITZ, C. **Extraction of copper from soil as affected by soluble components**

of oat straw and alfalfa meal. *Soil Sci.* 65, 1948 (275-280). [Mass. Agric. Expt. Sta.]

The addition of oat straw or alfalfa meal to samples of 2 different soils largely increased the amount of Cu leached from the soils by neutral ammonium-acetate and NaCl solutions. When the plant residues were steeped in ammonium acetate and the soils were extracted with the resulting solution, the amount of Cu leached was directly proportional to the amount of plant residue used, the alfalfa being about 16% more effective than the oat straw. The effect was not found with Cu sulphide or phosphate, and it is inferred that the Cu in the metallo-organic complex in the soil is the form affected.

[787] 63I.416.871.1
KOCH, D. E. V. **The manganese content of some Ceylon soils.** *Trop. Agricul.* 102, 1946 (219-223).

Mn in Ceylon soils is probably derived from the weathering of garnets, particularly spessartite. Uncultivated soils were found usually to contain more Mn than cultivated soils, and the Mn content of the soil was directly related to its texture. Paddy soils have a low content of Mn, which is present mainly in acid-soluble form. Termite-mound earth is always richer in Mn than is the surrounding soil. An average paddy crop removes about 1 lb./acre of Mn. Improved yields of paddy might be secured if the amount of Mn in the soil were reduced either by conversion into insoluble form or by its partial removal from the soil. Methods of achieving this are suggested, such as allowing the soil to dry before preparing the land, the use of a leguminous green manure, by a fairly large application of calcium carbonate which, apart from raising the pH of the soil and widening its CaO/MnO ratio, also favours oxygen absorption by the soil.

[788] 63I.416.871.1 : 63I.821.1 : 63I.544.7
SHERMAN, G. D.; FUJIMOTO, C. K. **The effect of the use of lime, soil fumigants and mulch on the solubility of manganese in Hawaiian soils.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (206-210).

In these soils, rich in Mn, the application of 2 tons of hydrated lime per acre, or the use of a mulch of boards which lowered the soil temperature and kept the soil surface moist, reduced the exchangeable Mn to $\frac{1}{3}$; the use of lime and mulch together reduced

it to $\frac{1}{4}$ of that in the control. The soil fumigants, chloropicrin and DD, did not affect the soil Mn, but increased the exchangeable Fe. These treatments decreased the Mn content and the Mn:Fe ratio in plants and increased the yield.

631.417 ORGANIC MATTER

[789] 631.417.768.3
KERN, W. [The occurrence of chrysene in soil.] *Helv. Chim. Acta* 30, 1947 (1595-1599). C.A. 42 (1002). [G.]

Benzene extracts of cultivated soils were purified chromatographically on activated Al_2O_3 from benzene and petrolether solutions. 3 zones were distinguished in ultra-violet light, the lowest corresponding to pure chrysene and the 2 upper ones to yellow crystalline substances which were probably hydrocarbons. A very small amount of a red substance was also isolated. Similar compounds were found in wood-tar pitch.

631.42 TECHNIQUE AND ANALYSIS

(See also Abs. No. 815)

[790] 631.42.005
MASON, R. S. New method of obtaining undisturbed soil samples. *Ecology* 29, 1948 (125-6). [Oreg. St. Dept. Geol. Portland]

Undisturbed samples of loose soil may be collected with a gun made by cutting off the orifice end of a common hand sprayer. The barrel is pushed vertically with a rotary motion into the bed until the desired depth is reached, which may be indicated by means of a scratch on the plunger handle. The surrounding material is removed down to the edge of the barrel and a cardboard disc slipped under the cutting edge. The sample is then extruded into a tube made by wrapping a sheet of paper round the barrel and sealing with gum or adhesive tape. The ends of the tube are sealed by means of cardboard discs and adhesive tape.

[791] 631.421
KOVATS, L. T. Principles of up-to-date field experimentation. *Kisérlet. Közlem.* 46, 1943 (183-195). C.A. 42 (1001). [Cent. Expt. Sta., Budapest]

Methods of randomized blocks and Latin squares are explained.

[792] 631.423.3 : 631.416.2
BURRIEL MARTÍ, F.; HERNANDO FERNANDEZ, V. El fósforo en los suelos españoles: I. Contribución a la determinación colorimétrica del fósforo. [Phosphorus in Spanish soils: I. Contribution to the colorimetric determination of phosphorus.] *An. Inst. Esp. Edafol.* 6, 1947 (543-582). [Sp.]

A modification of Ward's development [*Soil Sci.* 35, 1933 (85-97)] of Zinzadze's method. The changes include the use of (1) 50-c.c. flasks, (2) 0.3 c.c. of molybdenum blue, (3) phenolphthalein as the indicator, (4) Na_2SO_3 acidified with H_2SO_4 as the reducing agent, with Na_2CO_3 added after reduction to intensify the coloration, and (5) an electric bath to keep the temperature of heating at $95^\circ C$. The method is sensitive and very economical, the effects of the viscosity of the reagent are eliminated and the time of heating is reduced to 10 minutes.

[793] 631.423.3 : 631.811.4
PEECH, M.; BRADFIELD, R. Chemical methods for estimating lime needs of soils. *Soil Sci.* 65, 1948 (35-55). [Cornell Univ. N.Y.]

A critical examination of the more common methods of determining exchangeable H, lime requirement, soil reaction, readily available Ca and readily soluble Al, Fe and Mn in soils. The main conclusions are: (1) testing for exchangeable Ca alone is of little value in determining Ca deficiency or need for lime, except in very light soils whose exchange capacity is less than 2 m.e./100 gm.; (2) the presence of Al, Fe and Mn in acid soils must not be ignored in matters involving crop response to lime. Exchangeable Mn is best determined by the neutral NH_4 acetate method; (3) while no single chemical test is an infallible guide, the soil-reaction test affords the most useful single-value characteristic of lime need. 67 references.

[794] 631.423.4
GRAHAM, E. R. Determination of soil-organic matter by means of a photo-electric colorimeter. *Soil Sci.* 65, 1948 (181-183). [Missouri Agric. Expt. Sta.]

A simplified method for determining soil-organic matter for routine soil-testing laboratories is as follows: 1 gm. of 10-mesh air-dry

soil is weighed into a 250-ml. Erlenmeyer flask. 10 ml. of $K_2Cr_2O_7$ are added. 20 ml. of concentrated H_2SO_4 are added rapidly by means of a 250-ml. burette. The mixture is then quickly swirled for 10 seconds and allowed to stand for 10 minutes. 100 ml. of water are added. The mixture should stand 4-5 hours to allow time for the supernatant liquid to clear. The supernatant liquid is poured into absorption tubes and a reading taken on the photoelectric meter. By selecting the proper curve for standard soils the percentage of organic matter in the unknowns can be determined. It is convenient to set up 25-40 samples at a given time, making readings later. Comparison with the total-combustion showed that the rapid method was accurate when calibrated against a standard known soil. This eliminates the extra step of titration in the process and simplifies the routine. The rapid method was extremely accurate for soils containing less than 2½% of organic matter, less accurate for soils containing 2½-4½% and still less accurate for those above 4½ per cent.

[795] 631.423.4 : 631.417.2
JORET, G.; MALTERRE, H.; HIROUX, G.
Facteurs susceptibles d'influencer le dosage de l' "humus soluble." [Factors liable to affect the estimation of "soluble humus."] *Ann. Agron.* 17, 1947 (858-862). [F.] [Sta. Agron. Amiens]

The method of estimating "soluble humus" by treatment with NaOH after decalcifying with dilute HCl was investigated. Decalcification was found to be indispensable for non-calcareous as well as calcareous soils, while, if NH_3 was used as a peptizing agent instead of NaOH, it was essential that its concentration should be four times that of the NaOH. The values obtained increased regularly with the concentration of, and duration of contact with NaOH. Neither flocculation of the clay colloids with KCl to facilitate filtration nor duration of the boiling period during oxidation had much effect. The values obtained varied with the pH of the medium in which oxidation was carried out although use of the usual concentration of 0.045 n. NaOH gave results similar to those obtained when the medium was neutralized before oxidation. The

method gives entirely arbitrary results but the results are comparable with each other provided the experimental conditions are carefully controlled.

[796] 631.425.22 : 581.032.3
FRANCO, C. M.; CAMARGO MENDES, H.
Água inativa de alguns tipos de solos do estado de São Paulo. [Wilting percentage of some soil types of the State of São Paulo.] *Bragantia* 7, 1948 (129-132). [Pt.e.]

Wilting percentages were determined directly by the Briggs and Schantz method for 26 soils including sands, clays, peat and varieties of roxa soils. The Camargo-Vageler calculation of the wilting percentage by multiplying the hygroscopicity by 2 was shown to be inapplicable to these soils.

[797] 631.425.23
HESTER, J. B. Proposed method for measuring the movement of soluble fertilizer salts in the soil. *Science* 107, 1948 (99-100). [Riverton, N.J.]

A system of measuring the movement of soluble salts in soil consists of sinking 10 ft. + 10 ft. vertical-sided frames with sides 12 inches deep, about 6 inches into soil to which a known amount of chloride in water is added. As many different conditions as desired can be established. Soil samples are taken periodically from the 0-9-inch and 9-18-inch depths, screened and weighed into a collodion bag with equal amounts of water on the inside and on the outside. After standing for 24 hours to allow the chlorides to come to equilibrium, the clear solution on the outside of the bag is titrated with $AgNO_3$. The method can be used for the determination of the loss of soluble chlorides during periods of heavy rainfall.

[798] 631.425.23 : 631.435
ARONOVICI, V. S. The mechanical analysis as an index of subsoil permeability. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (137-141). [S.C.S., Pomona, Calif.]

Permeability values were compared with mechanical analyses of prepared (dried, 20-mesh sieved and recompacted) samples. The results indicated that mechanical analysis provided the most effective rapid method of estimating permeability coefficients for drainage planning, provided the clay content was rather low. Direct correlation with

silt + clay content was reliable within the permeability range 0.3-70.0 cc./cm²/hour, but permeability outside this range was more accurately estimated by also taking into account the sand-grain size distribution, and comparing the whole analysis with that of specimens of known permeability coefficient. The overall permeability of a field site may be calculated where several strata of different permeability occur, the value for each layer being weighted according to thickness and distribution. In the sediments studied, deposition and compaction had caused the long axes of the particles to lie parallel to the bedding plane, which was almost always horizontal, so that the horizontal permeability coefficient, which is important in drainage, was greater than the vertical. Field observations showed that in this locality the permeability values based on prepared samples needed to be multiplied by 3 or 4 depending on the type of sediment.

[799] 631.425.24 : 631.433.3
ELLINGER, G. ; QUASTEL, J. H. **Preliminary experiments in the study of the respiratory activity of micro-organisms suspended in thin films of fluid adhering to solid surfaces.** *Biochem. J.* 1948, 42 (214-218). [A.R.C. Unit Soil Metab., Univ. Coll., Cardiff]

It is demonstrated that the rate of oxygen uptake by a suspension of micro-organisms spread over the surfaces of suitable substances is similar to that obtained when the suspension is shaken in the Warburg apparatus. Suitable substances include pumice and soil, but in the latter case allowance should be made for the respiration of the soil's own microflora. Rate of oxygen uptake is not affected by increasing water content until the surface films assume a thickness at which diffusion of oxygen into the fluid becomes a limiting factor. This point, at which respiration drops, is a measure of the water-holding capacity of the absorbent, and the technique may be used for studying the effect of organic fertilizers and other substances on the water-holding capacity of soils.

[800] 631.427.3
VANDECAVEYE, S. C. ; OKAZAKI, R. **Leaf analysis as an aid in determining fertilizer needs.** *Proc. Wash. St. Hort. Assoc.* 1946, 1947 (165-178).

Spinach and raspberry-leaf samples were analysed for N, P, K, Ca and Mg and leaf blades and petioles were analysed for B, NO₃-N and PO₄-P. Grape-leaf petioles were analysed for NO₃-N, PO₄-P and total K. The concentration of nutrient elements in the leaves or petioles was not consistently associated with soil-type characteristics, fertilizer treatments and crop yields. The results suggest that the chemical composition of the leaf petioles is more indicative of the nutritional status of the plant than is the chemical composition of the leaves.

[801] 631.427.3 : 633.18
TOH JIN SIONG ; GALVEZ, N. L. **The use of rice seedlings in the determination of root-soluble phosphoric acid and potash in soils.** *Philipp. Agricut.* 31, 1947 (118-125).

The possibility of using rice seedlings in the Neubauer method of determining available P and K was demonstrated by germinating seeds in mixtures of sand and soil and in sand alone. The first batch was harvested 8 days after planting, and successive batches at 2-day intervals. During the first 10 days of growth K and soluble P appeared to migrate from the cell sap to the soil. Absorption then took place, reaching a maximum at 16, 18 and 20 days with K and at 18, 20 and 22 days with P. It is recommended, therefore, that the seedlings be harvested at 18-20 days; also it was found that HCl-treated, carefully washed, seashore sand could be used instead of pure quartz sand. As the individual cultures in a lot gave uniform values of P and K, 4 replications were sufficient. K-deficiency symptoms are described.

[802] 631.427.3 : 633.31
WALLACE, A. ; TOTH, S. J. ; BEAR, F. E. **Further evidence supporting cation-equivalent constancy in alfalfa.** *J. Amer. Soc. Agron.* 40, 1948 (80-87).

Determination of the K, Ca, Mg and total-cation content (in milliequivalents) of alfalfa plants grown in nutrient solutions of varying cation content showed that the total-cation content of leaves, roots and sap exhibited a very high, fair and high degree of constancy respectively, whereas the total-cation content of stems tended to increase with increasing amounts of K in the nutrient solution. The terminal leaves or terminal

leaves and stems appear to be the most suitable parts for use in field tests of cation deficiencies, especially of K and Mg.

631.43 SOIL PHYSICS

(See also Abs. Nos. 797, 798, 799, 859, 866, 868, 1015).

[803] 631.43 : 551.311.33
WILSON, H. A. ; BROWNING, G. M. **Loessial soil in western Iowa as construction material for earth dams.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (127-130).

A study of the influence of moisture content and compaction on the density and permeability of loess fill material.

[804] 631.43 : 631.3
HINE, H. J. **The machine and the soil.** *Agriculture* 54, 1948 (543-548).

Soil grip and rolling resistance, weight and wheel performance, the amenity of the soil in various conditions of weather or the "workability factor" are discussed. This factor is the range between the water content of the soil at the sticky point and the water content in the solid or powdery state. It is suggested that tests for these two items should be added to the Atterberg plasticity index.

[805] 631.431 : 631.434
LAURITZEN, C. W. **Apparent specific volume and shrinkage characteristics of soil materials.** *Soil Sci.* 65, 1948 (155-179).

In order to determine the influence of texture and structure on the shrinkage characteristics of soil materials two soils were selected for study and comparison. Shrinkage measurements were also made on mixtures of sand and two clay fractions from each of these soils, and on mixtures of these soils and lucerne meal. Separation of the clay fractions for study was designed to avoid the possibility of textural size classes masking each others' influence. The lucerne-meal mixtures were included to provide a material which would differ chiefly in its porosity characteristics. The effect of sand on shrinkage varied with the soil or clay component of the mixture. It narrowed the range more than it altered the character of the shrinkage until the sand content reached 25-50%. Organic matter in the form of

lucerne meal had little effect on shrinkage, but modified the character of the shrinkage and the apparent specific volume, and influenced the character of the two soils, a silt loam and a black clay, quite differently. The character of the shrinkage curve appeared to be related to the apparent specific volume of the soil mass. It was found that the dry apparent specific volume of clods was invariably higher than that of plastic blocks prepared from the same material. The data suggest that a quantitative measurement of the structural status of soils might be made by comparing the dry apparent specific volumes of clods and plastic blocks of the same material as a measure of the pore space which exists in the soil by virtue of structural development.

[806] 631.432 : 631.67
MUCKEL, D. C. **Water spreading for ground-water replacement.** *Agric. Engng.* 29, 1948 (74-76, 78).

Water spreading is the practice of diverting water from natural channels and spreading it over porous lands so that it can soak in and eventually become part of the ground water. Spreading is useful in areas where excessive pumping from wells is liable to deplete the ground-water supply.

As the object of spreading is to raise the entire water table the amounts of water used are much greater than in irrigation. As much as 5-8 acre-feet of water per acre may be put into the ground in a single day. Methods of spreading in use are (1) the basin method in which the water is impounded in a series of small basins, (2) the furrow or ditch method in which the water is passed through furrows, (3) the flooding method in which the water passes over the land in a thin sheet and at low velocity, and (4) the use of pits or shafts. (3) is the ideal method, while (4), which is not, strictly speaking, spreading, is not much used on account of high cost.

Areas suitable for spreading are at the mouths of canyons where they debouch from the mountains. These lands are made up of coarse material, are porous and generally not suitable for cultivation. When spreading is done on older, compact soils the infiltration rate often decreases to practically nil after a few weeks. The cause of this has not yet been ascertained, but there is

evidence that it depends on conditions in the top, humous layer of soil. Spreading the water to a shallow depth (1-2 inches) on a vegetated area seems likely to give the most consistently high infiltration rates.

[807] 631.432.2 : 581.144.2
LOBANOV, N. V. **A method for investigating the growth of roots in woody plants under various conditions of soil moisture.** *C.R. Acad. Sci. (U.R.S.S.)* 55, 1947 (547-550). For. Abs. 9 (287). [E.] [Briansk For. Inst.]

The effect of soil-moisture content on the growth of 3- and 4-year-old tree roots was studied by burying stoppered lamp glasses containing soil of various moisture contents near the trees. Rootlets were introduced through an aperture in the stopper. After 55-65 days all roots had made good growth with favourable moisture contents. The minimum soil-moisture contents for root growth were 6.11% for *Fraxinus excelsior* and *Larix decidua* and 5.11% for *Caragana arborescens*. *Picea abies* and *Pinus sylvestris* showed appreciable growth in soils of 2.07% moisture content.

[808] 631.432.2 : 625.7/8
RUSSELL, H. W.; WORSHAM, W. B.; ANDREWS, R. K. **Influence of initial moisture and density on the volume change and strength characteristics of two typical Illinois soils.** *Highway Res. Bd. Proc.* 26, 1946 (544-550). C.A. 42 (1002).

[809] 631.432.2 : 631.347.24 : 551.577
BAUMANN, H. **Zur Kenntnis des Wasserhaushalts eines lehmigen Sandbodens bei künstlicher und natürlicher Beregnung. [The water economy of a loamy sand soil under artificial and natural rain.]** *Ztschr. Pflanz. Düng.* 38, 1947 (150-166). [G.] [Inst. Kulturtech. Univ., Berlin]

Plots under late potatoes were subjected to a total of 0, 60 and 120 mm. of artificial rain given in 3 fortnightly applications, and the water content was ascertained at depths to 30 cm. The distribution of water in this alluvial soil was very uneven, differences of 2-4% by weight being normal for closely neighbouring positions. This unevenness increased from the surface layer downwards.

The sprinkler plant supplied water at nearly 60 mm./hour, whereas the natural rain fell at 1-5 mm./hour. With the former, the upper layer of the soil became full to capacity (12-15% by weight), then the lower layers in turn, whereas natural rain penetrated to the deeper layers before the upper layers became saturated. The water applied by sprinkling was used up far more quickly than that from rain, and it was established that the water loss from the tilled layer depended above all on the amount of water present in the soil.

Natural summer rain, even when heavy, was effective for a very short time, up to 6 mm. per day being taken from the tilled layer by the potatoes. With artificial rain the loss from this layer rose to 8 mm. per day, sinking in 3-4 days to the normal 1-3 mm. daily loss. Yield data for the plots sprinkled with 3×0 , 3×20 and 3×40 mm. (219, 280 and 320 dz./ha.) show that the higher yields—which took the form of an increase in the size and not in the numbers of individual tubers—were due partly to an increase in the intensity of growth and partly to the longer growing season afforded by the sprinkling.

[810] 631.432.2 : 631.417
MOREL, R. **Etude d'un sol de Grignon après la sécheresse de 1947. [A study of a soil from Grignon after the 1947 drought.]** *C.R. Acad. Agric.* 34, 1948 (166-169). [F.]

Samples were taken in early October from a silty soil to a depth of 180 cm. Humidity was less than 10% in the upper 40 cm., increased with depth to 16% at 150 cm. and appeared, in any given level of soil, to vary directly with the organic-matter content. Owing to the dryness of the soil, nitrates were present only in very small quantities at all levels. The apparent density had increased from the normal average of 1.25 to 1.7.

[811] 631.432.2 : 631.58
BROWNING, G. M. **Seasonal distribution of soil moisture under different crops.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (517-521).

In a silt-loam soil with about 2 inches of available water for each foot depth, the volume of water available at different depths for plant growth was recorded at monthly

intervals for various cropping systems. Available water under each crop of a maize-oats-meadow rotation and under continuous bluegrass was about the same. Lucerne reduced the available content considerably more, even to zero in years of light rainfall (25.5 inches), while fallow showed the highest moisture content.

[812] 631.432.2 : 631.58
DOBZAŃSKI, B. Gospodarka wodą w glebie lessowej. [Water relationships in loess.] *Rocz. Univ. Marii Curie-Skłodowskiej* 2B, 1947 (111-150). [Pl.e.] [Inst. Pedology, Univ. Lublin]

Percentages of water and some other moisture characteristics in a slightly podzolized loess were studied in four horizons during the period spring 1933 to the end of 1934. In 1933 the soil was under fodder beet harvested in early October; in 1934 under spring wheat harvested in early August. For both years comparisons are made with uncropped soil. Seasonal differences of precipitation were reflected in the soil-moisture percentages at all depth to such an extent that the sets of curves for moisture percentages at any depth were broadly similar for the cropped and uncropped soil. The two upper layers (I, 0-22 and II, 22-38 cm.) showed the greatest variations in water percentage in both years. In the summer and autumn of 1933 I, II and III (36-60 cm.) in the uncropped soil were all moister by 1-2% than in the soil under beet, but layer IV (60-90 cm.) was drier by 1-2% in the cropped soil from July to harvest. Up to May 1934 there was no consistent difference in the water percentages under wheat, but thereafter until the end of July the uncropped soil was markedly moister (usually by 3-4%) than the cropped at all depths. The differences between cropped and uncropped soil tended to vanish at about harvest time, which was preceded by heavy rain. The water-percentage curves of the greatest depth, under crop or not, were nearly flat.

It is concluded that the soil studied has a considerable ability to regulate and store water and that transpiration by wheat and beet exceeded evaporation from this soil. It is suggested that a statement of the dynamics of soil water is incomplete unless it includes an account of the water available and unavailable to crop plants.—R.N.

[813] 631.432.3
RUSSEL, J. C. The movement of water in soil columns and the theory of the control section. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (119-123).

Water was applied to the top of two confined 6-foot soil columns of undisturbed structure, taken from positions 4 feet apart. Infiltration and percolation curves for the periods of intake and of discharge respectively, from the bottom and repletion curves (excesses of intake over percolation) are provided. Only the percolation curves were rectilinear and the moisture-movement data for the 2 columns were very dissimilar, particularly as regards the time at which discharge from the bottom began (19.0 and 41.6 hours). The theory of percolation is discussed and a formula developed for the percolation of a heterogeneous column. A control section is any section in a profile that greatly retards the downward movement of water in that profile.

[814] 631.432.3 : 549.67
WEAVER, W. D. Water impedance with bentonite by the placement method. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (124-126).

A discussion of methods of sealing pond bottoms, the walls of canals and ditches and the faces of earthen dams by means of the swelling (Na) form of bentonite. The mineral, at full saturation, occupies a volume 15 times greater than when dry. It is of little use in sealing rocky or very clayey soils and is most useful for sandy or sandy loam soils.

[815] 631.434 : 631.432.3
CANNIÈRE, J. DE. Nouvelle méthode de détermination de la structure du sol. [New method for the determination of soil structure.] *C.R. Assemb. Inst. Inter. Rec. Better. Bruxelles* 1947, Comm. 10, pp. 4. [F.]

The state of aggregation is a function of texture, composition of the cationic component and amount of ferric or humic gels cementing the soil particles. Attempts to evaluate soil microstructure include that of Vageler and Alten who introduced the "structure factor," i.e., the difference between the weights of the clay fraction before and after the removal of the cementing gels by oxygenated water and HCl, but the

method involved is tedious and not applicable to large numbers of samples. Permeability methods in the field have given varied and inconsistent results due to the heterogeneity of the macrostructure, but reproducible results have been given in the laboratory by a method based on that of Zunker, which has been used for investigating flooded soils. In experiments on soils treated with NaCl and various Ca salts not only did permeability vary with the concentration of the salt, but also with the anion of the Ca salt added. The volume of the percolates was small for polder soils, greater for loams and highest for sandy soils. Permeability also increased with humus content, but conflicting results were obtained with very ferruginous soils. It was evident that high permeability is conditioned by cultivation, roots and freezing and thawing and that it expresses the resultant of all the factors affecting soil structure.

[816] 631.434 : 631.44
AQUINO, D. I.; ENGLE, L. I. **Structure of certain soil types in the College of Agriculture.** *Philipp. Agricst.* 31, 1947 (141-146).

Two deep-phase, one medium-phase and one shallow-phase clay loams were studied with respect to structure (by means of the Bouyoucos method), moisture content and water-holding capacity. The existence of a natural ultimate structure which is stable for any one soil type was suggested by the fact that the slaking power of the deep- and medium-phase Lipa clay loams was greater than that of the shallow-phase Ibaan and less than that of the deep-phase Los Baños clay loams. The surface soils contained more naturally slaked materials and showed lower moisture content and water-holding capacity than the subsoils. Cultivation appeared to increase the slaking power, colloid content, moisture content and water-holding capacity, but the natural ultimate structure of the soil that was altered by cultivation, may gradually be restored by fallowing.

[817] 631.435.1/3 : 631.432.2 : 631.414.1
KRYNINE, P. D. **Some experiments on capillary flow of moisture through gravels and silts.** *Highway Res. Bd. Proc.* 26, 1946 (474-483). C.A. 42 (1003).

By plotting the accumulated volume of moisture lifted by a soil against time,

discharge curves were traced, and their slope compared with that of the time curves. Conclusions are regarded as pertinent only to the described conditions.

[818] 631.436.005
GURR, C. G. **An electrolyte resistance thermometer for measurement of soil temperature.** *Aust. J. Coun. Sci. Indust. Res.* 20, 1947 (500-502).

The thermometer, using NaCl solution as the resistance element, measures temperature to an accuracy of approximately $\frac{1}{4}^{\circ}\text{C}$. and has sufficient sensitivity for soil temperature to be measured with a standard commercial Wheatstone bridge. The electrodes are of platinum wire spirals fused onto copper leads which are cemented into short pieces of capillary tubing. These are cemented into a 4-inch length of glass tubing which contains the electrolyte. The whole is placed in a 5-inch length of brass tubing for mechanical strength and the ends are sealed with wax.

Owing to the high heat capacity of the thermometer, there is a lag in response to temperature changes which might introduce errors in temperature measurements of surface soils. Temperature changes are slow at depths and the lag is not significant.

631.44 SOIL TYPES

(See also Abs. Nos. 816, 1047).

[819] 631.44 : 625.7/8
CASAGRANDE, A. **Classification and identification of soils.** *Proc. Amer. Soc. Civ. Eng.* 73, 1947 (783-810). B.A. BIII 1947 (197).

Classifications used in civil engineering are reviewed.

[820] 631.445.2 : 551.311.33
DOBZJAŃSKI, B. **Regradacja bielocowych gleb lessowych. [Regradation of podzolized loess soils.]** *Rocz. Univ. Marii Curie-Skłodowskiej* 2B, 1947 (27-46). [P.l.e.] [Inst. Pedology Univ. Lublin]

Numerical data are tabulated for two Podolian loess soils, (A), which is podzolized, and (B), a regraded podzol, in which regradation has followed deforestation and cultivation, the resulting soil being classed as a grey or dark-grey regraded loess. Mechanical analyses of the two soils are typical of loess.

The porosity, capillary and maximal water capacity, plasticity, total surface and hygroscopic characteristics of the two soils are similar but are improved in (B). Chemically (B) is markedly superior, with an organic-matter content of about 2% to a depth of 55 cm. as against 1% to a depth of 10 cm. in (A). The pH of the upper 40 cm. of (A) was 4.7, as against 5.5 in (B). Cation-absorption capacity, exchangeable Ca and available K were much higher in (B), while the level of available P was so high that a response to P fertilizing would be improbable. The content of substances soluble in 20% HCl was higher in (B), except for CaO which was highest in the surface of (A). The ratio CaO : MgO was about 0.85 in (A) and 0.6 in (B).

No boundary between eluvial and illuvial horizons was visible in (B). In both soils free CaCO₃ was encountered only at a depth of about 125 cm.—R.N.

[821] 631.445.4
PELIŠEK, J. Studie diluviálních půd (ve spraších) a diluviálního podnebí v oblasti Svrateckého úvalu na Moravě. [A study of diluvial soils (in loess) and diluvial climates of the Svratka valley, Moravia.] *Práce Moravské Přírod. Společnosti* 12, No. 1, 1940 (1-15). *Biol. Abs.* 21 (2026). [Cz.g.]

The Svratka valley is comprised of massive complexes of loess in which are always found 2 buried horizons of diluvial black soils, one above the other. The deep buried black soils are characterized by humus horizons, 100-150 cm. deep, and by lobe-shaped humus infusions in the underlying oxidized horizons, 80-100 cm. deep. This deep black soil shows signs of intensive hydrolytic weathering at the time of its formation and it is possible that when these black soils in diluvium were formed upon the Svratka valley loess, the weather was cold and humid. Upon this black soil new loess was blown and this upper black soil is darker and shallower due to feeble hydrolytic weathering. Every black soil layer with underlying loess forms a compact climatic and pedogenic unity.

[822] 631.445.5 : 631.613
VALENTINE, K. A. Effect of water-retaining and water-spreading structures in revegetating semidesert range land. *N. Mex. Agric. Expt. Sta. Bull.* 341, 1947, pp. 22.

Semi-desert range land cannot be improved by water-retaining and water-spreading structures. Neither widely spaced terraces, dams with brush hedges, contour channels, brush dams or small contour earthen structures improved vegetative cover. The soil was unable to retain sufficient moisture long enough for the establishment of seedlings. In some places the sandy soil prevented much runoff and reduced the amount of water that could be intercepted by the dam or contour.

[823] 631.445.53 : 631.415.36
LAMBIN, A. Z.; LAMBINA, T. F. [The influence of physico-chemical factors in the improvement of the B₁ horizon of a columnar solonets and on the yield of crops.] *Trudy. Kirov. Inst. S.-Kh.* 20, 1941-1946 (83-110). *C.A.* 42 (706). [R.]

In pot experiments with soil from the B₁ horizon results were best when the soil was treated with H₂SO₄ and the excess acid neutralized with CaCO₃ and MgCO₃. The Na in the exchange complex was reduced from 21.6 to 4.6 m.e. per 100 gm. of soil. By mixing the B₁ with the A horizon or by adding A material of a chernozem, the quantity of adsorbed Na was reduced and the crop yield increased. Treatments with S and gypsum reduced the adsorbed Na, but S depressed nitrification and availability of P. Mixtures of peat and S or gypsum were more effective than the individual ingredients. Additions of fertilizers to the ameliorative ingredients increased crop yields.

[824] 631.445.55 : 631.466.1/3
FLETCHER, J. E.; MARTIN, W. P. Some effects of algae and molds in the rain-crust of desert soils. *Ecology* 29, 1948 (95-100). [S.C.S.; Ariz. Agric. Expt. Sta.]

Following a succession of gentle rains, the rain-crust of Arizona red desert soils was found to be impregnated with algae and fungi which increased its tensile strength considerably and rendered it easy to remove. Species of *Oscillatoria*, *Nodularia*, *Microcoleus*, *Nostoc*, the *Chroococcaceae*, *Rhizopus*, *Mucor* and *Botrytis* were identified. The pH of the crust and subsurface samples did not differ. The crust contained a greater percentage of silt and clay than the soil below. Increases of up to 300% in organic C and of 400% in N were found in crusts where microbial

growth was extensive, the largest N increases being related to the presence of *Nostoc*. The presence of *Azotobacter* could not be demonstrated. Field observations indicated that the presence of algae and fungi in the rain-crust improved filtration, decreased erosion, and aided in the establishment of plant seedlings.

[825] 631.445.6
PELÍŠEK, J. Zelezité konkrece z moravských cervenozemí terra rossa. [Iron concretions of Moravian terra rossa.] *Práce Moravské Přírod. Společnosti* 12, No. 13, 1940 (1-12). Biol. Abs. 21 (2026). [Cz.g.]

Red soils of fossil type occur in cavities and clefts of limestone rocks. Iron concretions occurring in these soils have the following chemical composition: 63-73% of Fe_2O_3 as goethite and haematite, 6-10% of Al_2O_3 as aluminium silicate and hydrargillite ($\text{Al}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$) and 10-32% of other ingredients. Small quantities of SiO_2 , TiO_2 , CaO , MgO , K_2O , Na_2O and P_2O_5 are present. The insoluble residue after dissolving in hot 20% HCl resembles kaolin. These iron concretions are oval or kidney shaped, from 2 mm. to 5 cm. in diameter, brown, ochre-yellow, red-brown or grey-brown in colour.

[826] 631.445.6 : 631.414.2
ALEIXANDRE FERRANDIS, V. Caracterización de algunas arcillas españolas por cambio de bases y curvas de deshidratación. [The characterization of some Spanish clays by base exchange and dehydration curves.] *An. Inst. Esp. Edafol.* 6, 1947 (455-474). [Sp.f.]

Clay-mineral extracts of red soils of Valencia and Malaga were predominantly kaolinitic. The base-exchange capacity of the clays varied in the same sense as the quantity of water lost on ignition at 700°C. and was reduced by 80-90% by the ignition. There was no clear relationship between the exchange capacity and the $\text{SiO}_2/\text{R}_2\text{O}_3$ and $\text{SiO}_2/\text{Al}_2\text{O}_3$ ratios. It was concluded that the soils were formed under humid and neutral or slightly acid conditions, and that the arid-soil characteristics which they present were due to a change of climate.

[827] 631.445.7 : 625.7/8
FRUHAUF, B. A study of lateritic soils. *Highway Res. Bd. Proc.* 26, 1946 (579-593). C.A. 42 (1002).

631.459 SOIL EROSION

(See also Abs. Nos. 844, 977)

[828] 631.459 : 551.48
BROWN, C. B. Damages resulting from uncontrolled runoff and sedimentation. *J. Soil Water Conserv.* 3, 1948 (21-23, 47).

Examples of flood and sediment damages attributable mainly to watershed deterioration are cited and supported by figures showing the economic losses involved. Flood-borne sediment is the cause of silting damage to reservoirs, damage to land resources and associated scour of flood-plain soils and stream banks. Bottomland damage is shown by the thickness of modern sediment deposits on the bottomlands which averages about 4 feet in the South Carolina Piedmont, equivalent to a loss of 3.1 inches of soil over the entire upland part representing 94% of the area. Sediment is also causing the silting-up of irrigation and drainage ditches and of rivers and harbours. A large item of expense is the removal of sediment from the ditches and the maintenance of navigable channels in rivers and harbours.

[829] 631.459 : 551.48
AGRICULTURAL ENGINEERING. Effects of conservation practices on runoff. *Agric. Engng.* 29, 1948 (114-116).

The views of five research workers are quoted on what is known about run-off in relation to erosion, weather and conservation practices, what are the main gaps in present-day knowledge, and what are the desirable directions for further research. The available experimental data are inadequate to draw any generalization. It is found, however, that although conservation measures such as terraces and dense plant covers reduce run-off under normal conditions, under extremely intense rainfall they are often quite ineffective. Conservation practices are more effective when a storm comes if the soil is dry than if it is wet. Data obtained from small experimental catchments cannot safely be used to deduce what may happen on larger areas. Run-off tends to be greater from long than from short slopes. Fundamental research is needed into the laws governing the movement of water into and through soils, the laws of evapo-transpiration, the relation of drop size to infiltration and to

intensity of rainfall, and the effect of time of occurrence of intense rain within a storm on run-off and erosion.

[830] 631.459 : 551.48 : 631.42
WILTSHIRE, G. R. **The measurement of run-off and soil loss from plot experiments.** *J. Soil Conserv. Serv. N.S.W.* 4, 1948 (40-44). [Cowra Res. Sta.]

A method is described for determining, within 5 days following rain, the amounts of run-off and soil loss from 42 plots.

[831] 631.459 : 625.7/8
ORR, R. E. **Roadside erosion.** *J. Soil Conserv. Serv. N.S.W.* 4, 1948 (19-24).

Types of check dams for use on coarse sandy loams overlying decomposed granite are described.

[832] 631.459 : 631.58
BEDELL, G. D.; KOHNKE, H.; HICKOK, R. B. **The effects of two farming systems on erosion from cropland.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (522-526).

Comparable catchments of fertile silt loams with fairly short and regular (2-5%) slopes and of pH 5.5, on which visible loss from erosion was small, were placed under the rotation maize-wheat-meadow and were farmed (1) under the prevailing system of straight-row planting and cultivation, moderate fertilizing and the return of most crop residues or (2) under a conservation treatment including contour planting and cultivation, return of all residues, liming to 6.5, ploughing-under manure for maize and more liberal fertilizing.

The records of run-off losses under the two treatments show that, by conservation measures, water run-off was reduced to $\frac{1}{6}$; loss of total solids during a rotation was reduced from 5 to 2 tons/acre, and loss of organic matter per acre was decreased from the equivalent of $2\frac{1}{2}$ tons of manure to that of $\frac{3}{4}$ ton. N losses from maize lands fell to $\frac{1}{5}$ and from wheat lands became negligible. Loss of P (largely organic) fell to $\frac{1}{4}$ and of K to $\frac{1}{2}$, although 10 times as much K had been applied. Yields of crops were increased by 30-60% by the conservation treatment.

[833] 631.459 : 631.58
CARREKER, J. R. **Conservation farming on a 100-acre farm unit.** *Agric. Engng.* 29, 1948 (60-63).

Description of the changes effected in 6 years in land use, production and incomes on a farm containing 69 acres of crop land (including hay), 10 of open pasture and 21 of woodland. The total crop land was not changed, but the acreage under cotton and wheat was reduced, and the acreage under hay crops was increased. The value of crops, based on uniform prices, remained practically constant. By including small grains in the rotation, crimson clover in the permanent pasture, and growing sericea and kudzu on steep, eroded areas it was possible to make use of dairy cattle and give them nearly year-round grazing. Income rose from \$1321 in 1941 to \$1749 in 1946.

[834] 631.459 : 631.58
UHLAND, R. E.; HENDRICKSON, B. H. **Evaluation of cropping systems for soil and water conservation in the Southeast.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (527-531).

Soil loss in the Southeast is heaviest in summer, when the intensity and volume of rainfall are greatest. Cropping systems should include close-growing summer legumes such as lespedeza. Tests with kudzu which, like sericea lespedeza, has been effective in erosion control and in trebling the yields of a following maize crop as against maize grown continuously, have shown its persistence under rigorous treatment. Land in which kudzu was established in 1945 was ploughed and seeded to maize in spring 1946. The maize failed because of a faulty planter, and in June the area was disc-tilled and hegari was planted. Sufficient kudzu crowns survived to produce a fairly good cover by mid-October.

[835] 631.459 : 631.58
VAN DOREN, C. A.; BAUER, F. C. **Effect of crops and soil treatment on yields and erosion.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (543-548).

The rates of erosion during the production of various crops, and the effects of fertilizing and rotations on erosion and yields are presented for loessial upland soils in Illinois under the rotation maize-wheat-lespedeza. The plots were 140 feet long, farmed on the contour and located on 5 and 9% slopes. Soil losses on the 5% slopes were greater from wheat than from maize (13.4 and 6.6

tons/acre) while losses were about equal from the two crops on 9% slopes (14.1, 15.7). The critical erosion periods for maize and wheat respectively were June-July and October-April with March as the most critical month due to the soil's dispersion and loosening on thawing. Loessial plots on a 10% slope that received manure (1 ton for every ton of crop produced), K_2O at 100 lb./acre per year, and a total of 8 tons of limestone and 4 tons of rock phosphate in 17 years lost 9 inches of soil as against 20 inches lost by an untreated plot in 17 years.

[836]

631.459 : 631.58

PANG, C. Y.; CHENG, Y. P.; HSIEH, T. C. [Study of soil conservation in relation to crop cultivation.] *J. Agric. Assoc. China* No. 184, 1947 (13-26). [Ch.e.]

The study was made on yellow-earth plots on a 15-20% slope under an annual rainfall of 101 cm. The greatest erosion losses were caused by the 60-cm. rainfall of July, August and September. Over a period of 4 years (1) grass plots and (2) intercropped plots, with hairy vetch and wheat in winter and maize and soybean in summer, suffered much less from erosion than those under (3) summer sweet potato and winter broad bean and (4) fallow, and their organic-matter and soluble-salt contents were greater.

[837]

631.459 : 631.58 : 631.312.5

MCKAY, H. C.; BAKER, G. O. Effect of crop residues on erosion control and grain yields under southern Idaho dry-land conditions. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (553-556).

In plots of silt loam under the rotation winter wheat-fallow, straw residues were (a) turned under by the mouldboard plough, (b) mixed with the surface soil by a one-way disc plough and (c) left on the surface by the use of a modified mouldboard plough. The least soil loss (1 ton/acre) and slightly the highest grain yields resulted from (c), and the highest loss (3 tons/acre) from (a). In all cases the soil loss was 3 to 4 times greater, when the residues were burnt on the surface before applying treatments (a), (b) or (c). No consistent differences in soil moisture were found. The lowest amount of nitrate N was always produced under a straw mulch, but was always sufficient for optimum crop production.

[838]

631.459 : 631.582

SMITH, D. D. The effect of crop sequence on erosion under individual crops. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (532-538). [S.C.S. Colombia, Missouri]

In a 5-months growing period, maize after grass with legumes allowed a soil loss of 2 tons/acre, and of 5, 8 and 12 tons/acre after sweet clover (as hay or green manure), maize and oats respectively. Soybean plots showed soil losses of $4\frac{1}{2}$ and $1\frac{3}{4}$ tons/acre when the previous crops were maize and grass with legumes respectively. Soybeans in 8-inch rows lost only 63% of the amount lost from 42-inch rows. An autumn-seeded small-grain crop after soybeans reduced winter and spring-erosion losses to less than half, the order of effectiveness being barley, wheat, spring oats. After a maize crop there was little difference in effectiveness between (1) drilling wheat in autumn on the maize stubble and (2) leaving the maize stalks standing and drilling oats in spring. Wheat as a cover was twice as effective when liberally fertilized. The annual rotation small grains-lespedeza is effective against erosion, but its effectiveness is somewhat lessened by grazing.

A table is provided, showing the measured soil loss from 15 rotations and the estimated loss from 7 others by the use of sequence-study data.

[839]

631.459 : 631.61

FOOD AND AGRICULTURE ORGANIZATION. Soil conservation. An international study. *F.A.O. Agric. Studies* 4, 1948, pp. 189.

An account is given of soil deterioration and of some of the measures taken in various countries to correct misuse of land. China and U.S.A. in particular furnish examples of land use and abuse under many combinations of physical, social and economic conditions. Subjects discussed include soil formation and soil profile; influence of topography, vegetation, crops and season; effect of economic factors on soil maintenance. Losses from mismanagement of farm, forest and range lands in U.S.A., China, Latin America, Mediterranean and Tropical and South Africa are described and conservation methods are advocated for cultivated land, grazing land and forest land. Shifting cultivation or "kaingin" and its effect on organic matter and erosion are described in tropical grassland, woodland and forest

areas. The 8 land-capability classes used in U.S. Soil Conservation Service are detailed and legislation dealing with soil conservation in Australia, New Zealand, Latin America and Africa is discussed.

[840] 631.459 : 633.2
NIXON, W. M. **Revegetation of eroded lands in the high plains and rolling plains of Texas and Oklahoma.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (549-552).

A procedure is described for the revegetation of eroded land, for example, of deep shifting sands, shallow soils and steep eroded areas. The annual rainfall is 15-30 inches and is suitably distributed for establishing grassland. 80% of the seedlings have been successful. Sections are included on: the tillage required; the use of sorghum, small grains or suitable weeds as cover crops; suitable grasses and mixtures for heavy or light, deep or shallow upland soils; seeding information and care of the young stands.

[841] 631.459 : 634.95
BAILEY, R. W. **Reducing runoff and siltation through forest and range management.** *J. Soil Water Conserv.* 3, 1948 (24-31). [Intermount. Forest. Serv. Expt. Sta., Ogden, Utah]

The maximum degree of control that can be expected anywhere from watershed management is the restoration of essentially the same watershed conditions which existed prior to their deterioration. The restoration of depleted forest or range cover is slow and the improvement of soil is even slower. For watershed management to become fully effective in controlling run-off and sedimentation within limits that are normal for each basin may require many years. Examples are cited comparing clear cutting and burning with the preservation of vegetation in their effect on run-off and sedimentation.

631.46 SOIL MICROBIOLOGY

(See also Abs. Nos. 777, 1021, 1031)

[842] 631.461 : 546.77
MULDER, E. G. **Importance of molybdenum in the nitrogen metabolism of microorganisms and higher plants.** *Plant and Soil* 1, 1948 (94-119). [Agric. Expt. Sta., Groningen]

It was found that the addition of 0.001-107 of Mo to 50 c.c. of culture solution of *Aspergillus niger* increased the yields of dry mycelium and that a medium with nitrate as the source of N requires a higher Mo supply than when an ammonium salt is used. In experiments with *Azotobacter chroococcum*, with culture solutions with no combined N, more Mo was required than with nitrate media, while no response to Mo was observed when $(\text{NH}_4)_2\text{SO}_4$ was the source of N. N fixation by pea nodules was curtailed in the absence of Mo, and pronounced N-deficiency symptoms were shown.

[843] 631.461 : 631.435
KIRYŮ, T.; AKIYAMA, K. **Soil micro-organisms and mechanical properties of sugar-cane soils.** *Taiwan Sug. Expt. Sta. Rept.* 1, 1947 (29-37). C.A. 42 (1003).

Numbers of bacteria and actinomycetes were about equal in a given soil, were greater in loams than in sands, and varied with the moisture content of well drained soils. The number of fungi was relatively small and independent of the soil's physical properties.

[844] 631.461 : 631.81 : 631.452
RAO, W. V. B. S. **Soil microbiology and bearing on concepts of fertility and mineral deficiency.** *J. Univ. Bombay* 15, 1946 (45-47). B.A. BIII 1948 (1).

A thesis in which factors influencing soil fertility, and the type of fertilizer required, are reviewed. The higher temperature in July promotes bacterial activity, with a resulting depletion of the organic matter of the soil. In Delhi soils the organic matter is not adequately utilized, due to lack of available N in the form of inorganic fertilizers. The element lacking in a soil is determined by incubation in a synthetic medium at 34° and determination of the increased CO_2 production after various additions.

[845] 631.461.1.3
PEEVY, W. J.; NORMAN, A. G. **Influence of composition of plant materials on properties of the decomposed residues.** *Soil Sci.* 65, 1948 (209-226). [Iowa Agric. Expt. Sta., Ames]

The changes occurring during the decomposition of oat straw with varying proportions of added lignin and other plant materials, both in the absence and presence of soil poor in organic matter, were studied over a period of 28 months.

Materials high in lignin were decomposed to a much smaller extent than those low in lignin, and contained a greater proportion of residues resistant to extraction with 72% H_2SO_4 . Soils receiving the more resistant materials had a higher content of N, probably as lignoproteins, and their organic-exchange capacity increased by up to 200% above that of the control, as against an increase of 25% in soils receiving cellulose materials. The fraction of the exchange capacity due to organic matter varied from 28% in the control to 50% in soils receiving materials high in lignin. Hypoiodite was more suitable than hypochlorite for studying the nature of soil organic matter, as lignin is more susceptible to oxidation by hypoiodite and the oxidation is complete in 20 minutes as against several days with hypochlorite.

[846] 631.461.1/3 : 631.841
VERGNAUD, H. **Accelerated production of humus matter by the addition of small quantities of ammonium salts.** *Bull. Assoc. Chim.* 63, 1946 (365-373). C.A. 42 (1370). [F.]

Directions are given for preparing artificial manure from straw and other agricultural residues with the addition of $(\text{NH}_4)_2\text{SO}_4$ or cyanamide.

[847] 631.461.1 : 631.435.1
CHALAUST, R. Note sur le pouvoir ammonifiant des sables de la Camargue. [Note on the ammonifying capacity of Camargue sands.] *Ann. Inst. Pasteur* 74, 1948 (62-66). [F.]

The ammonifying capacity was investigated for sand from an unmanured vineyard, a coniferous forest, an uncultivated coastal region supporting only xerophytes, and periodically submerged sand. These soils differed considerably in humus and N content and represented various stages in geobiological evolution. It was found that the amount of liberated NH_3 after treatment with dried blood was inversely proportional to the humus content and was unaffected by salinity. No relationship between ammonification and the surface flora was apparent. The microflora of slightly humified sand was abundant, but less varied than that of sand with a high humus content.

[848] 631.461.3 : 546.56
LEES, H. **The possible importance of copper in soil nitrification.** *Biochem. J.* 42, No. 1, 1948 (xvii). [Rothamsted]

Using the Lees percolation apparatus it was shown that nitrification was inhibited by a concentration of M/250 CuSO_4 and stimulated by one of M/2000-4000. Addition of M/250 or M/500 CuSO_4 to the percolates of a fen soil restored its nitrifying power which had been destroyed by Na diethylthiocarbamate. This effect could not be produced with Zn, Cd, Fe or Mn salts.

[849] 631.461.3 : 631.811.9
LEES, H. ; MEIKLEJOHN, J. **Trace elements and nitrification.** *Nature* 161, 1948 (398-399). [Rothamsted]

The effect on nitrite formation in cultures of nitrifying bacteria of iron and copper, alone and with other trace elements, was investigated. Adding of 600 $\mu\text{gm.}$ of Fe per 100 ml. of culture solution gave an increased yield over the control of 56% ; after 11 days' incubation, 14 or 28 $\mu\text{gm.}$ of Cu gave an increase of 17%, Fe + Cu gave an increase of 92%, and Fe+Cu+Zn gave an increase of 103%. In other experiments a more comprehensive mixture of trace elements omitting Fe had a depressing effect, but trace-element mixtures of Fe+Cu and Fe+Cu+Zn had a stimulating effect.

[850] 631.461.5
TÓTH, L. **The biological fixation of atmospheric nitrogen. The problem of the assimilation of gaseous nitrogen.** *Monographs Natural Sciences Budapest* 5, 1946, pp. 116. [E.]

The subject is discussed from the point of view of (1) assimilation of gaseous nitrogen by free-living micro-organisms and by micro-organisms living in symbiosis with plants and with animals ; (2) practical utilization of biological nitrogen fixation. Approximately 380 references.

[851] 631.461.51 : 546.77 : 546.411
JENSEN, H. L. **The influence of molybdenum, calcium and agar on nitrogen fixation by *Azotobacter indicum*.** *Proc. Linn. Soc. N.S.W.* 72, 1947 (299-310). [Dept. Bact., Univ. Sydney]

Azotobacter indicum requires Mo for N fixation. The effect begins at a Mo concentration of 0.001-0.0001 p.p.m. and reaches

its maximum at 0.1-1.0 p.p.m. Mo cannot be replaced by Va. A favourable effect of Ca on N fixation could not be detected. Addition of 0.1-0.4% agar to the liquid medium accelerated N fixation.

[852] 63I.461.51 : 63I.415.1 : 63I.43
MCKNIGHT, T. **Free-living nitrogen-fixing bacteria in soils of Queensland.** *J. Aust. Inst. Agric. Sci.* 13, 1947 (196).

pH and soil moisture affect the occurrence of azotobacter and clostridia; the numbers of positive determinations in soils with pH below 5.9 were much lower than in soils with higher pH and were lower when soil moisture was below 10%. The number of positive samples in soils increased from sands through sandy loams, loams, clay loams to black earths. Azotobacter may be present in the grey-brown soils of Western Queensland, but is absent from granitic soils, weakly podzolized coastal soils and red earths. In a fertile alluvial soil, azotobacter numbers were higher after Rhodes grass had been ploughed in. In pot tests no measurable differences in effect on legumes were found between azotobacter alone or in association with rhizobium.

[853] 63I.461.51 : 63I.847.2
CLARKE, F. E. **Azotobacter inoculation of crops: III. Recovery of Azotobacter from the rhizosphere.** *Soil Sci.* 65, 1948 (193-202). [Iowa Agric. Expt. Sta.]

The roots of tomato plants were dipped into suspensions of *Azotobacter vinelandii*, *A. chroococcum* or Azotogen before planting in loam of pH 5.9 in which no *Azotobacter* could be demonstrated. The experiment was repeated in loam of pH 6.2 containing 1000 *Azotobacter* per gm. Cultural studies of root samples taken at intervals up to 75 days after inoculation showed a consistent decline in *Azotobacter* numbers from the high levels established by inoculation, also that the numbers of total, denitrifying and nitrifying bacteria were unaffected by inoculation. Survival of *Azotobacter* was better in the more acid loam from which the plants were removed four days after inoculation than in cropped soil. Neither the addition of tomato-root fragments to the loam of pH 6.2 nor cropping to mustard, broccoli or soybeans affected the *Azotobacter* content of the soil.

[854] 63I.461.52
SCHMIDT, O. C. Über einige einfache Nährböden zur Kultur von *Bacterium radicicola*. [Some simple culture media for *Bacterium radicicola*.] *Ztschr. Planz. Düng.* 38, 1947 (165-166). [G.] [Inst. Pflernähr., Univ. Berlin]

The following recipe has proved excellent: Finely ground fresh leaves or roots of *Lupinus albus* are boiled for 2 hours in 6 parts of tapwater, filtered, sterilized and brought to pH 5.9-6.8 or to 7.1. In 1.5 or 2% agar at 26-28°C. almost all required varieties of bacteria, including those of *Cicer*, *Lathyrus*, *Melilotus*, *Phaseolus*, *Pisum*, *Trifolium*, *Serradella* and *Vicia* are easily grown. Exceptions are the *T. repens* variety which requires a *Trifolium* basis, and that of *Robinia pseudacacia* which requires a decoction of its own leaves. Rye grain in 10 parts of water may be used instead of *Lupinus albus* as a satisfactory basis for many varieties. A liquid medium, especially good for *Pisum*, *Lupinus* and *Phaseolus* varieties, may be prepared from finely chopped rye grain and straw (1:1) boiled for 2 hours in 6-10 parts of tapwater, filtered and mixed with 10% by volume of a 7.5% brewers' yeast decoction and brought to pH 6.2.

[855] 63I.461.52 : 63I.415.1
JENSEN, H. L. **Nitrogen-fixation in leguminous plants. VII. The nitrogen-fixing activity of root nodule tissue in Medicago and Trifolium.** *Proc. Linn. Soc. N.S.W.* 72, 1947 (265-291). [Dept. Bact., Univ. Sydney]

With lucerne, nodule efficiency decreased significantly in sand of pH near or below 5, but fixation still took place at pH 4.5-4.8. The net gain of N also declined significantly at pH 5 or less. The numbers of nodules decreased conspicuously in sand of pH 5.5 or less, but the size increased. With subterranean clover, fixation was not influenced significantly by reaction, and N was fixed in sand of pH 4.2-4.5. Nodules were usually more numerous in acid than in alkaline sand. Both lucerne and subterranean clover grew equally well at pH 4.5-5 and pH 7-7.5 when given combined N as nitrate or ammonia. A Mo content of lucerne nodules of 10-25 p.p.m. dry substance was necessary for maximum N-fixing efficiency. In nodules of subterranean clover a Mo content of 4-8 p.p.m. was required.

[856] 631.461.52 : 633.086.25
BJÄLFVE, G. Halmens betydelse för baljväx-
todling. [The importance of straw in the
cultivation of legumes.] *LantbrHögsk.
Baljväxtlab. Medd.* 11, 1948 (1-6). [Sw.]

In some preliminary field trials and pot-
culture experiments with pretreatment of
seed with straw extracts and additions of
straw to the soil, the results were suggestive
of a possible beneficial effect on the nodu-
lation and yield of legumes.—S.H.

[857] 631.461.61
ALARIE, A. M.; GRAY, P. H. H. **Aerobic
bacteria that decompose cellulose, iso-
lated from Quebec soils. I. Isolation
and description of the species.** *Canad.
J. Res.* 25C, 1947 (228-241). [McGill Univ.]

A starch culture medium was inoculated
with 13 different soil samples, incubated
for 24 hours at 28°, and the resulting cultures
plated on starch-peptone agar. After incu-
bation the starch-hydrolysing organisms
were isolated, and their ability to decompose
cellulose determined in a filter-paper medium.
Of the 103 strains of starch-hydrolysing
bacteria, 13 hydrolysed cellulose and com-
prised species of *Bacillus* *Vibrio* and *Bacter-*
ium. These are described in detail.

[858] 631.461.74
PREVITERA, A. Sulla variazione dell'
Escherichia coli nel terreni. [Variation of
E. coli in soil.] *Atti Accad. Fisiocrit. Siena
Sez. Med.-Fis.* 13 (1/6) : 57, 1945 (118-123).
Biol. Abs. 21 (1998). [I.]

In an experiment designed to correspond
physically to the situation found in soil, a
culture of smooth, typical *E. coli* was placed
at the top of a long (110 cm.) sand filter.
Periodically the filter was moistened with
sterile water. After 8 months variations
were noted in the type of organisms obtained
from the bottom of the filter. They became
progressively more like *Aerobacter aerogenes*,
considered biochemically (VP, MR, indol
and citrate reactions). The morphological
and staining characters were typically coli-
form. The demonstrated possibility of
derivation, perhaps mutative, of *A. aerogenes*
from *E. coli* in the soil is discussed, also the
significance of the findings to the potability
of drinking water.

[859] 631.462 : 631.416 : 631.43
MALOWANY, S. N.; NEWTON, J. D. **Studies
on steam sterilization of soils. I. Some
effects on physical, chemical, and bio-
logical properties.** *Canad. J. Res.* 25C,
1947 (189-208). [Univ. Alberta]

The surface 6 inches of four loam soils
were air-dried, sieved, allowed to stand for
2 days at optimum moisture content and
steamed at 15-17½ lb. pressure (120°C.) for
45 minutes, and again the next day for
30 minutes. Halves were then inoculated
with nitrifying, ammonifying and sulphur
bacteria. Sterilization lowered the water-
holding capacity by 1% and the moisture
content at which the sticky point was
reached. Results of shrinkage experiments
show that during the early stages of drying
the volume decreased in proportion to the
amount of water lost, but during the last
stages the loss of moisture became large
compared with volume decrease. Shrinkage
was slightly greater in the sterilized than in
the unsterilized soil, while the last-stage or
'residual' shrinkage was greatest in soils
with high organic-matter content. Capillary
rise was significantly greater in unsterilized
soils, but there were no significant differences
in pH values. Sterilization induced an
increase in water-soluble P, especially in
soils high in organic-matter, and in water-
soluble sulphate. Nitrification increased
with organic-matter content, but the nitrate
level remained low in sterilized soils through-
out the 39 weeks of incubation. After 10
weeks the rate of nitrification in the sterilized,
reinoculated soil increased, while accumulated
NH₃ decreased rapidly. Greatest ammonifi-
cation occurred in sterilized, reinoculated
soil, and was roughly proportional to the
organic-matter content. The NH₃ content
of the sterilized soils remained at a constant
level above that of the unsterilized.

[860] 631.466.2 : 525.5
VERONA, O. Sulla presenza e numero degli
Actinomicete nel terreno agrario in rapporto
alle diverse stagioni dell' anno. [On the
presence and number of Actinomycetes
in agricultural soil in relation to the
various seasons of the year.] *Mycopa-*
thologia 4, 1947 (48-53). *R.A.M.* 27 (94).
[I.g.sp.e.f.]

The number of Actinomycetes was greatest
in autumn.

[861] 631.466.2 : 576.809.7
GOTTLIEB, D.; BHATTACHARYYA, P. K.;
ANDERSON, H. W., ET AL. **Some properties
of an antibiotic obtained from a species
of *Streptomyces*.** *J. Bact.* 55, 1948
(409-417). [Univ. Ill., Urbana]

An antibiotic, chloromycetin, produced
by a species of *Streptomyces*, is described that
inhibits Gram-negative and -positive and
acid-fast bacteria.

631.47 SURVEYS

[862] 631.47 : 551.48
POTTER, W. D. **Analytical procedures for
determining the effect of land use on
surface run-off.** *Agric. Engng.* 29, 1948
(64-73).

The importance, in making the determi-
nation, of taking all variables and factors
into account is emphasized, and the following
conclusions are drawn.

Comparisons of surface run-off from two
catchments should be reduced to a common
denominator of normal rainfall if the effect
of changed land use is to be measured.
Relationships between rates of rainfall and
of run-off cannot be established unless other
factors affecting run-off can be controlled.
Direct comparisons between peak rates of
run-off or between run-off amounts can
seldom be made unless corrections are applied
for dissimilar rainfall. Relationships between
run-off from two catchments can best be
determined by comparing probability curves
computed from the run-off data, but such
relationships should not be extrapolated
much beyond the range of the experimental
data, unless a careful study is first made of
all the factors involved.

[863] 631.47 : 581.5
FINA, A. L. DE. Reconocimiento agroeco-
logico per medio de una serie prefijada de
plantas cultivadas. [Agro-ecological
surveying by means of a series of culti-
vated plants.] *Inst. Suel. Agrotec. Argentina
Tir. Interna* 7, 1947, pp. 8. Mimeo. [Sp.]

The agricultural possibilities of regions of
scattered settlement may be rapidly assessed
by observations on the absence or presence
of 2 series of indicator plants: (1) cacao,
pineapple, banana, lemon, date palm, olive,
fig, vine, walnut, peach, pear and apple in
order of susceptibility to winter frost, and

(2) cotton, water melon, maize, wheat, oats
and barley in decreasing order of temperature
requirement for ripening of seed. Interpre-
tation of data concerning the abundance,
yield, degree of fruit maturity attained and
water applied, if any, for each indicator plant
present in a locality provides information on
climatic and soil conditions. The diameter
of a survey locality may be 10-60 km.
depending on the local physiography, and
most localities may be surveyed in a day.

631.48 SOIL FORMATION

[864] 631.48
NOVÁK, V. Pudní novotvary—specifické
znaky geneze. [New formations of soil—
a specific feature of soil genesis.] *Věst.
Čsl. Akad. Zeměd.* 21, 1947 (311-321).
[Cz.r.e.]

A survey of secondary soil products,
so-called new soil formations, of physico-
chemical or microbiological origin. These
formations are divided into four groups:
(1) crystals of various salts in macroscopic
forms, (2) soil efflorescences, (3) concretions,
(4) pseudo-new formations—soil layers which
have become hardened and packed together
by percolation. Each group is described in
detail in relation to the soil types of Czecho-
slovakia.

631.5 CULTURAL OPERATIONS

(See also Abs. Nos. 788, 816, 832, 833, 946,
947, 985, 986, 1010, 1014)

[865] 631.512 : 631.414.2
WOODRUFF, C. M.; SMITH, D. D. **Subsoil
shattering and subsoil liming for crop
production on claypan soils.** *Proc. Soil
Sci. Soc. Amer.* 1946, 11, 1947 (539-542).

Claypans were susceptible to shattering by
deep tillage during periods of low rainfall
when lespedeza as a summer legume had
dehydrated the subsoil and induced a stable
granular condition in the pan. Shattering
to a depth of 20 inches appeared to have little
effect on the drought resistance of the soil
or on the growth of oats and sweet clover,
but increased the yields of maize and de-
pressed those of barley. Liming the subsoil
during the shattering process increased the

yield of maize and oats, prevented the depression of barley yields and greatly increased the growth of clover taproots into the deeper impermeable horizons. Shattering, together with deep placement of lime and fertilizer, appears to be a solution to the problem of growing maize on claypan soils.

[866] 631.512 : 631.432.4
ALFANI, A. **Soil and water conservation in Italy.** *F.A.O. Europ. Bull.* 4, 1948 (281-285).

A programme of soil "systemization" is discussed for the maintenance of soil moisture, for erosion control and for improvement of efficiency in land use. The ploughed layer of the soil has been increased by deep tilling so as to increase water infiltration and air circulation, and to increase the water-storage capacity of the soil for the dry summer months. In some areas the breaking of volcanic tufa soils to 3-4 feet with rope-pulled ploughs and blasting powder placed 6 feet deep, has changed the soil from a shallow layer with poor grasses to good agricultural land. Water-storage capacity has increased from 70-150 mm. of water in soils ploughed to less than 1 foot to 250-500 mm. in deeply ploughed soils.

[867] 631.512 : 631.557
RUSSELL, E. W. **Deep tillage.** *Agric. Engng. Rec.* 2, 1948 (70-73). [Rothamsted]

Deep tillage should be practised only on drained land where it increases the size of air spaces in the soil and often increases the speed of drainage. Deep ploughing is possibly more reliable than subsoiling for improving ease of drainage. Land with impermeable subsoil or high water table must never have the subsoil loosened. Deep ploughing, i.e. 4-6 inches deeper than is customary, controls weed growth early in the growing season and allows spring-grown crops to be planted earlier. It enables lime and fertilizers to be incorporated more deeply; there is some evidence that on land with poor subsoil, crops respond to large amounts of P and K if the soil has been ploughed deep and the fertilizer given in two dressings, one before and one after ploughing. From experiments carried out since 1944 there is no indication that deep ploughing will depress yields, no matter what kind of

sand or clay is brought up from the subsoil. Broken limestone or solid chalk brought up from the subsoil is dangerous.

[868] 631.544.7 : 631.436
WHITE, D. G.; JONES, M. A.; PAGAN, C. **Mulching derris resulted in lower soil temperatures.** *P.R. Fed. Expt. Sta. Rept.* 1946, 1947 (5-6).

Applications of mulch of lemon grass and cane leaves in January reduced soil temperatures by as much as 16°F. At a depth of 3 inches temperatures were generally a few degrees higher than at 6 inches. A second application of mulch in August maintained these lower temperatures. Mulched derris required less weeding.

[869] 631.544.7 : 631.445.7
WHITE, D. G. **Mulching tropical plants.** *Agric. in Americas* 7, 1947 (143-145).

By mulching is understood the maintenance of 6 inches or more of plant debris on the soil surface above the major portion of the root system. The advantages of mulching in the tropics are the conservation of soil moisture, particularly during drought, addition of nutrients to the soil, improvement of soil structure, reduction of soil erosion, reduction of the time required for weeding and lowering of soil temperatures. A disadvantage is too great an accumulation of soil moisture in regions of regular, heavy rainfall. Other disadvantages are distribution of obnoxious seeds in the mulching material, fire hazards of dry mulch, harbouring of animal- and insect-pests and disease organisms. The advantages, however, outweigh the disadvantages. It is important to maintain the mulch at a depth of at least 6 inches, preferably 10-12 inches, throughout the life of the plant, thin layers having little value.

[870] 631.557 : 551.577
SARASOLA, A. A. **La sequía como factor determinante de los rendimientos de trigo, avena, cebada y centeno en el departamento de Utracán (La Pampa, Argentina).** [Drought as the determining factor for yields of wheat, oats, barley and rye in the department of Utracan (La Pampa, Argentina).] *Dir. Agropec. La Plata Pub. Tec.* 4, No. 4, 1947, pp. 35 [Sp.]

A discussion of the literature concerning the times at which cereals are most susceptible to drought and concerning attempts to correlate yields with rainfall. In Utracan, which is marginal from the point of view of cereal production, there is so close a correlation (0.934 ± 0.018) between the total rainfall for June to September inclusive and wheat yields, that it is possible, in a given district for which yield and precipitation data are available, to predict the yields about 2-3 months in advance to within 66 kg./ha. Almost equally close correlations exist between rainfall and the yields of oats, barley and rye.

[871] 631.58:551.48.
CHAMBERS, T. B. **Conservation farming reduces runoff and siltation.** *J. Soil Water Conserv.* 3, 1948 (32-34).

Results are quoted of experiments on contour cultivation, strip cropping, terracing and stubble mulching.

[872] 631.58:631.452
ATKINSON, H. J.; WRIGHT, L. E. **Comparative effect of keeping soil under continuous cultivation and keeping it in continuous grass.** *Sci. Agric.* 28, 1948 (30-33). [Sci. Serv. Expt. Farm, Ottawa]

Soil samples from adjacent experimental areas of Uplands sand of low fertility were taken in 1945. One area had been in continuous grass and the other under continuous cultivation for 15 years. Results of chemical analysis were compared with those of samples from the same plots in 1931 when the soils were considered to be uniform. The general level of fertility, soil reaction, N content, organic matter, exchangeable bases and readily soluble P were decreased by continuous cultivation and increased under continuous grass. On the former grass area yields of potatoes and tomatoes in 1945 were more than twice as great as on the previously cultivated area. Periodic return of Uplands sand to sod would improve its productive capacity.

[873] 631.582
ODLAND, T. E.; SMITH, J. B. **Further studies on the effect of certain crops on succeeding crops.** *J. Amer. Soc. Agron.* 40, 1948 (99-107).

The results of 12 years of a continuing study of the factors involved in the effects of 11 different preceding crops on the yields of a succeeding crop of potatoes, mangolds, rutabagas or onions. Neither the length of the interval between harvesting the preceding and planting the succeeding crop, nor any change in soil pH (which varied during the period from 5.2 to 6.0) due to a preceding crop was significantly correlated with yields of the succeeding crop, except with mangolds, whose yields decreased as pH increased.

The most and least favourable preceding crops for potatoes, and the potato yields after these crops, were: rye (394 bushels/acre), with oats and onions also favourable; millet (298 bu./acre), with rutabagas and potatoes also unfavourable. The corresponding results for the other succeeding crops were (1) for mangolds: onions (24.7 tons), potatoes, cabbage; millet (10.5 tons), mangolds. (2) for rutabagas: onions (648 bu.), oats, maize, rye, cabbage; rutabagas (400 bu.), millet, mangolds. (3) for onions: rye (604 bu.), oats, buckwheat, maize; rutabagas (116 bu.), cabbage, mangolds.

Some crops required only 1 year to produce a harmful condition for certain following crops; others gradually produced unfavourable conditions over a period of years—for example, rutabaga in its effect on onions. Partial soil sterilization with chloropicrin benefited mangolds after either potatoes or mangolds, but the harmful effect of a preceding mangold crop was not completely removed.

[874] 631.582:631.67
NELSON, C. E.; LARSON, C. A. **Crop rotations under irrigation at the Irrigation Branch Experiment Station, Near Prosser, Washington.** *Wash. Agric. Expt. Sta. Bull.* 481, 1946, pp. 27.

When crops were grown on the same plots annually, manure increased the yield of lucerne; 12 tons/acre of manure each year was satisfactory for maize and sugar beet, but not for wheat and potatoes. Manured 2-year rotations of sugar beet and maize were satisfactory, but yields were smaller than for 5- and 7-year rotations which included lucerne. 2-year rotations with potatoes and sweet clover as a green-manure crop were unsatisfactory. 5- and 7-year

rotations were best for maize and potatoes. From the point of view of wireworm injury, potatoes were satisfactory in the 7-year rotation only following lucerne. Sugar beet grew best in the 7-year rotation following lucerne or one year removed from lucerne.

[875] 631.586:93
HARGREAVES, M. W. M. **Dry farming alias scientific farming.** *Agric. Hist.* 22, 1948 (39-56).

A historical study of the forms of dry farming that developed in the State of Montana, until the droughts of the 1920's and 1930's brought about great changes in the methods used.

[876] 631.589
MASEFIELD, G. B. **Grass burning: some Uganda experience.** *E. Afric. Agric. J.* 13, 1948 (135-138).

Reasons for and against burning are discussed. Burning is undesirable where its objects can be achieved by other means. If there is no practical alternative, then only carefully controlled methods should be used.

631.6 RECLAMATION. DRAINAGE. IRRIGATION

(See also Abs. Nos. 798, 822, 874, 958, 1014, 1032, 1084)

[877] 631.612
MOGILNER, I. Algunas consideraciones sobre dunas y experiencias realizadas en el Vivero "Florentino Ameghino" de Miramar, dependiente de la Direccion de Agricultura e Industrias de la provincia de Buenos Aires, para su fijacion. [Concerning dunes and work on dune reclamation at Miramar at the "Florentino Ameghino" vivary of the Agricultural and Industrial Directorate of the Province of Buenos Aires.] *An. Rural* 15, 1947 (315-345). [Sp.]

The province contains thousands of square kilometres of shifting coastal dunes. Their formation and mechanical analysis, the chemical composition of their water- and HCl-soluble extracts, the local climate and the succession of plant associations are discussed. Reclamation succeeded only when done in 2 stages: (1) Immobilization of the sand, which could not be achieved by seeding or by planting rhizomes, but by

setting out plants of *Ammophila arenaria*, *Spartina ciliata* and *Stipa brachychaeta*, (2) The sowing of *Adesmia incana*, *Cynodon dactylon*, *Melilotus indicus* and *M. albus* for further enrichment of the soil. Seed germination was much improved by treatment for 2 hours with commercial H_2SO_4 , followed by washing in water for 1 hour.

[878] 631.612
MORETTI, O. Fijacion de dunas y medianos en la Provincia de Buenos Aires. [The reclamation of coastal and inland dunes in the Province of Buenos Aires.] *An. Rural* 15, 1947 (251-314). [Sp.]

The 3 stages of reclamation are stabilization of the sand by pioneer plants, enrichment by sowings of legumes and grasses and establishment of pasture land or forest. Some eucalyptus species have proved excellent for the consolidation of inland and semi-stable dunes distant from the saline conditions of the coast.

[879] 631.612:634.957
AGUIAR, J. F. Fixação de dunas. [Stabilization of sand dunes.] *Rev. Flor. Rio de J.* 5, 1946 (38-40). For. Abs. 9 (309). [Pt.]

A brief account of the work in progress and plans for the fixation of sand dunes at Marambaia. The species to be used in the various stages of stabilization are *Diplothemium maritimum*, *Ipomoea pes-caprae* and various Gramineae, suitable Myrtaceae and *Casuarina*, respectively.

[880] 631.613
WILSON, H. A.; RIECKEN, F. F.; BROWNING, G. M. **Soil profile characteristics in relation to drainage and level terraces.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (110-118).

The investigation at all profile depths of the following characteristics of soils makes it possible to determine where level conservation terracing may safely be used, and where graded terraces are required:—permeability factor, soil volume, capillary and non-capillary porosity and the dispersion ratio, which is a measure of the ease with which the soil aggregates disperse in water and thus of susceptibility to erosion, and which also provides a measure of surface sealing. Determinations of moisture equivalent and wilting point are required to

establish the soil's limitations in respect of crops and crop sequences. Level terracing requires high permeability throughout the profile, and intercropping or the pasturing of livestock may impair permeability at the surface.

[881] 631.616
CLAERHOUT, L. Le traitement des terres inondées en 1944. [Treatment of soils flooded in 1944.] C.R. Assemb. Inst. Inter. Rec. Better. Bruxelles 1947, Comm. No. 15, pp. 5. [F.]

The effects of flooding with sea water on soil structure, vegetation and soil flora and fauna are described. Although plants vary in their ability to withstand saline conditions, growth of crops is impossible while the salt content is above 2%. Barley is the most adaptable of the cereals, all legumes except red clover and lucerne are very sensitive to salt, and beet, especially sugar beet, is the most tolerant crop. Experiments in 1946 when there were no drought periods showed that the permeability of fertilized fields increased progressively during the course of plant growth due to penetration of the roots. The more growth made by the crops the better the soil structure, which was thus indirectly favoured by heavy manuring. Of the Ca amendments, CaSO_4 , CaO and CaCl_2 were the most effective, but CaCO_3 gave practically no improvement. Deep cultivation should be avoided.

[882] 631.62 : 631.432.3
DONNAN, W. W. Model tests of a tile-spacing formula. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (131-136). [S.C.S. Imperial, Calif.]

An account of a continuing laboratory-tank study concerning the applicability to drainage problems in irrigated areas of the tile-spacing formula.

$$S = \frac{4P(b^2 - a^2)}{Q}$$

in which S = distance between drain lines; P = the permeability constant for the soil; Q = the effluent from the drain line per unit of time; b = the height, above the impervious layer (bottom of the tank), of the middle point of the phreatic surface and a = the height of the drain above the impervious layer.

Using homogeneous sandy soils, close correlations were obtained between the calculated and actual spacings, provided that additions, constant for any one soil were made to a and b to represent the "retention potential" or thickness of that zone above the phreatic surface that was partially saturated and might transmit water laterally. This retention potential was 45 cm. for one, and 65 cm. for another sand.

[883] 631.671 : 546.331.31 : 631.811
REIFENBERG, A.; ROSOVSKY, R. Saline irrigation water and its effects on the intake of ions by barley seedlings. *Palestine J. Bot.* 4J, 1947 (1-13). [Hebrew Univ., Jerusalem]

Saline irrigation water in Palestine has a preponderance of NaCl . The intake of K by barley seedlings was not impeded by Na , but K impeded the intake of Na . The intake of P was only impeded by Cl where the concentration of Cl was very high, but the addition of P considerably decreased the intake of Cl except when Cl was excessive. The intake of nitrates was not influenced by the presence of NaCl . It may be possible that fertilizing with P and K will prevent the intake of NaCl .

631.8 FERTILIZERS

[884] 631.81 : 581.192
HOPKINS, D. P. Soil treatments and nutritional values. *Food Manuf.* 22, 1947 (349-354). B.A. BIII 1947 (198).

A review of the effects of fertilizers on the nutritional value of crops.

[885] 631.81 : 631.435.1
OPITZ, K. Düngungsversuche auf Sandboden. [Fertilizer experiments on a sandy soil.] *Ztschr. Pflanz. Düng.* 38, 1947 (111-131). [G.]

The records of 10 years of experiments to determine the effect of fertilizers on the fertility of a coarse sand soil poor in humus, Ca and nutrients, of pH 4.2-4.4 and under the rotation potatoes—summer cereals.

The effect of farmyard manure in this soil was attributable to its nutrient content only. Complete mineral fertilizing trebled the potato and quadrupled the cereal yields. Saltpetres at 40-80 kg./ha were the most

effective source of N for cereals. N at 30 kg./ha + green manure satisfied the N requirement of potatoes, nitrochalk being most effective. Of the K fertilizers, the chlorides, especially the Na-containing kainite, acted as weakly alkaline fertilizers. The Mitscherlich test for the content of available nutrients in the soil proved accurate for potato and barley crops.

631.811 PLANT NUTRITION

(See also Abs. Nos. 772, 777, 793, 987, 1011)

[886] 631.811: 539.16
SAUCHELLI, V. **Radioisotopes, their function in studying the mechanics of plant nutrition.** *Agric. Chem.* 3, No. 1, 1948 (33-35).

The use of radioactive Ca^{45} has shown that lucerne plants absorb the greater part of their Ca content from applied lime even when the lime is worked into the top 3 inches of an acid soil with pH 4.8. The use of radio-phosphorus has shown that wheat takes up its main P before the heading-out stage. Radioisotopes of K, I, Cl, S, As and Zn are being used to follow the movements of these elements in growing crops.

[887] 631.811: 631.414.3
COOPER, H. P.; PADEN, W. R.; GARMAN, W. H., ET AL. **Properties that influence availability of calcium in the soil to plants.** *Soil Sci.* 65, 1948 (75-96). [S.C. Agric. Expt. Sta.]

A review of work on the factors determining relative availability and absorption of nutrient ions by plants. The factors discussed include: the standard-electrode and ionization potentials of the nutrient element; the nature of the predominant clay mineral of the soil; the location of the exchange bonds that in some soils is unsuited to the fixation of large amounts of strong divalent cations; the relative strength of nutrient ions as opposed to their concentration; the solubility of nutrient compounds; the racial and individual protective characteristics of the plants, including a treatment of the selective accumulation or exclusion of nutrient elements illustrated by reference to the composition of wheat and cotton plants grown under similar or unlike conditions.

[888] 631.811.3: 631.811.4
BEAR, F. E.; TOTH, S. J. **Influence of calcium on availability of other soil cations.** *Soil Sci.* 65, 1948 (69-74). [N.J. Agric. Expt. Sta.]

In experiments on 20 soils, using lucerne roots as cation extractants, cation nutrition for lucerne was optimal when Ca, Mg, K and H occupied respectively 65, 10, 5 and 20% in equivalents of the exchange complex. K was the dominant cation in the plant, and was absorbed in excess of plant needs, unless soil Ca was kept high. Especially in soils of low exchange capacity or maintained at a low pH, moderate K dressings during the crop season were less wasteful than one large application at planting. When in lucerne tops the K content was less than 1% or the Ca-K ratio greater than 4, the plant responded markedly to soluble-K dressings. On sandy and acid soils the customary liberal K dressings caused widespread Mg deficiency, and plants responded markedly to dressings of MgSO_4 .

[889] 631.811.5
WALLACE, A.; TOTH, S. J.; BEAR, F. E. **Sodium content of some New Jersey plants.** *Soil Sci.* 65, 1948 (249-258).

About 100 different species and varieties of plants, including many important grasses, vegetables, weeds and salt-marsh and dune plants, have been analysed by flame photometry in order to identify, for use in the study of the possible value of Na as a fertilizer constituent, plants which tend to accumulate Na. Cabbage, carrots, radish, spinach and beet accumulated considerable Na, whereas potatoes, tomatoes, legumes (except wild white, red and Ladino clover) and grasses (except those natural to salt marshes) did not. Cattail, plantain, red clover and yarrow accumulated Na when grown on salt-marsh or dune areas.

[900] 631.811.9: 546.79
JACOBSON, L.; OVERSTREET, R. **The uptake by plants of plutonium and some products of nuclear fission adsorbed on soil colloids.** *Soil Sci.* 65, 1948 (129-134). [Univ. Calif.]

In a study of the absorption of Pu and its long-lived fission products, the roots of 3-weeks-old barley plants were immersed in 100 mgm./l. suspensions of Ca-bentonite

to which had been added Y, Ce, Sr, Te, the three oxidation states of Pu (PuO_2^{++} , Pu^{++++} , Pu^{+++}) or Zr^{95} in equilibrium with its Cb daughter at rates of 10 microcuries of radio-element per litre. After a 24-hour absorption period the β and γ activities of the fission products and the α activity of Pu were determined on the dried, ground roots and shoots. The experiment was repeated with 28.7-575 mgm./l. clay concentrations and radio-Y, and with dwarf peas grown for 3 months in sandy soil activated by the addition of Y, Ce, Zr+Cb, and Sr. The barley roots fixed or absorbed large fractions of the initial doses of the radio-elements from the clay suspensions, and some activity was translocated to the shoots, varying in amount from 1.60% of the initial dose for Sr to 0.00045% for Pu^{+++} . It is concluded that the roots competed successfully with the clay particles for the radio-elements, and presumably this transference could occur either by contact exchange or by uptake from solution of the hydrolysed element. With increasing clay concentration, competition became less favourable for the roots up to a certain point beyond which increases in clay had little effect on uptake. Results of the long-term soil experiments agreed closely with those obtained from the clay suspensions. In every case the soil contained sufficient activity to injure the plants.

[901] 631.811.9: 631.821.1
PURVIS, E. R.; DAVIDSON, O. W. **Review of the relation of calcium to availability and absorption of certain trace elements by plants.** *Soil Sci.* 65, 1948 (111-116). [N.J. Agric. Expt. Sta.]

The availability of B is possibly affected by the Ca ion, but that of Cu, Mn and Zn is determined by the soil reaction, and decreases as this approaches and exceeds neutrality. The soil mass is honeycombed with pockets of varying pH, and when the more acid pockets are raised in reaction to points in excess of pH 6.5, deficiency symptoms of one or more plant nutrients may occur, for example in periods of moisture saturation in overlimed soils, or during extremely dry periods.

631.812/3 PROPERTIES OF FERTILIZERS

(See also Abs. No. 915)

[902] 631.812: 539.215
HOPKINS, D. P. **Granulation and the problem of storage of fertilizers.** *Manuf. Chem.* 18, 1947 (205-210). B.A. BIII, 1948 (1).

The prevention of caking by adequate granulation appears to be the only way of overcoming the problem of storage of continuously produced but seasonally used fertilizers. Technical methods are described.

[903] 631.813: 631.415.1
LEMMERMANN, O. Die Wirkung einer Düngung von verschiedenen chemischen und physiologischen Charakter auf den Reaktionszustand des Bodens und die Höhe der Ernten. [The effect on soil reaction and crop yields of fertilizer applications of varied chemical and physiological nature.] *Ztschr. Pflanz. Dting.* 38, 1947 (89-111). [G.]

Plots of loamy sand poor in Ca received 300 dz./ha. of artificial manure every 2 years and 50-75 kg./ha. of K_2O per year, also one of the following treatments providing constant amounts of N and P, with or without chalk or peat, during 20 years:—(1) acid: $(\text{NH}_4)_2\text{SO}_4$ + super., (2) neutral: urea + dicalcium phosphate, (3) basic: NaNO_3 + basic slag and (4) alternately acid and basic.

With (2), the pH sank from 6.6-5.0, and the effect of 57.5 dz./ha. of CaO applied as chalk during 2 years disappeared within 17 years, and that of 10 dz./ha. within 4 years. With (1), the pH fell to 4.0 and the effect of the larger chalk dressing disappeared within 10 years. With (3), the pH fell to 5.2 on the peated plots, and remained steady on the others. With (4), there was a slight tendency towards acidity. The hydrolytic acidity was highest on the peated plots, which also produced the largest yields as a result of the buffer and absorptive activity of peat. pH values suitable for various crops on peated and non-peated plots respectively were: barley 7-8 and 6.3-8; beet 7-8.3, 6.3; winter rye 6-7.7, 5.3; potatoes 4.5-7.8, the physiologically acid fertilizing being most suitable on the heavily chalked plots. Suitable pH ranges for maize and sugar beet were 5.6-7.4 and 6.3-7 respectively.

631.82

MINERAL AMENDMENTS. LIME

(See also Abs. Nos. 753, 788, 1020, 1078)

[904] 631.821.1: 539.215
JENSEN, S. T.; KJÆR, B. Undersøgelser over Kornstørrelsesfordelingen i en Række danske Kalk- og Mergelforekomster. [Particle-size distribution in a number of Danish limestones and marls.] *Kgl. Vet. og Landbohøjsk. Aarsskr.* 1948 (149-165). [Da.e.]

A number of ground-limestone and marl samples from various sources were analysed for particle-size distribution by sifting and pipette analysis. The efficiency of various fractions in neutralizing soil acidity was tested by field trials and pot-culture experiments. Whilst the latter failed to give clear-cut results the pH values obtained in the field were consistently and distinctly higher where finer particles (below 5 mm.) were used during the two first years. After four years the differences between the effects from fine and coarse fractions were only slight.

All the samples were sufficiently finely ground to produce rapid neutralization, when well mixed with the soil.—S.H.

[905] 631.821.1: 581.192
SMITH, G. E.; HESTER, J. B. Calcium content of soils and fertilizers in relation to composition and nutritive value of plants. *Soil Sci.* 65, 1948 (117-128). [Campbell Soup Co.]

The addition of Ca has very variable effects on the Ca content of plants, and often shows considerable influence on the protein, P, lignin or silicate content; maize grains have shown an increase of 40% in protein content. Factors such as the balance of soil nutrients and differences between plant species, etc., are involved. A section is included on the influence of liming on the composition of wool, milk and meat.

[906] 631.821.2: 631.416.7
REED, J. F.; CUMMINGS, R. W. Use of soluble sources of calcium in plant growth. *Soil Sci.* 65, 1948 (103-109). [N.C. St. Coll.]

Applications of soluble Ca have been useful: (1) In soils of low exchange capacity where high levels of exchangeable Ca are required. In such a soil (2.4 m.e. per 100

gm.) 640 lb. of gypsum built up a much higher Ca level than 2400 lb. of dolomitic lime (1.32 and 0.86 m.e. respectively in the second year). The percentage of peanut cavities filled in this soil (taken as a measure of Ca availability) for the two treatments was 86 and 45 respectively. It is stressed that soils whose colloid fraction is mainly of the 1:1 type (as in kaolinite) will release more Ca at a given Ca level than soils of bentonitic- or organic-type colloid; (2) in soils which must supply Ca for plant growth, but whose reaction must be kept fairly low, for example, in tobacco soils; (3) in soils of low or high exchange capacity where the crops, for example peanuts, need a high Ca concentration at certain stages of growth and/or in certain zones of the soil. Soluble Ca is of little use on acid soils of high exchange capacity that are low in exchangeable Ca and high in exchangeable H.

[907] 631.828: 539.16
MARX, T.; SAHM, U. Über die Radioaktivität und den Düngewert von Plantoradon. [The radioactivity and manurial value of Plantoradon.] *Ztschr. Pflanz. Düng.* 38, 1947 (195-200). [G.]

A record of Neubauer and scintillation tests refuting prospectus claims for this material.

[908] 631.828: 539.16
LEMMERMANN, O.; MICHAEL, G.; SCHMIDT, O. C. Die Wirkung von radiumhaltigen Düngemitteln. [The effect of radium-containing fertilizers.] *Ztschr. Pflanz. Düng.* 38, 1947 (185-195). [G.]

An account of experiments carried out to test the value of the radium-containing fertilizer Plantoradon. No increases in plant yields, soil respiration, ammonification or nitrification resulted from the use of this fertilizer.

631.83 POTASH FERTILIZERS

[909] 631.83: 545
EWAN, M. A.; FORD, O. W.; SCHALL, E. D. Determination of potash in fertilizers. *Anal. Chem.* 20, 1948 (192-194). [Indiana Agric. Expt. Sta., Lafayette]

The possibility of low results from the estimation of K in fertilizers due to the solubility of K_2PtCl_6 in acid alcohol was

investigated by treating the residue with acid alcohol alone and with acid alcohol made from alcohol saturated with K_2PtCl_6 . Increases in K_2O values ranging from 0.17% to 0.47% were given by the latter treatment when the original alcohol was 80%. With acid 95% alcohol saturated with K_2PtCl_6 the increases ranged from 0 to 0.39%, while acid 95% alcohol alone gave higher K_2O values than acid 80% alcohol alone. The use of normal Na acetate in the estimation gave lower K_2O values than treatment with normal NaOH.

631.84 NITROGEN FERTILIZERS

(See also Abs. Nos. 846, 988)

[910] 631.841.1 : 631.813
DAVEL, H. B. **Research in agronomy.** *Farm. S. Africa* 22, 1947 (1041-1043). [Dept. Agric. Res., Pretoria]

Continuous use of $(NH_4)_2SO_4$, without the addition of lime, increases soil acidity. On plots fertilized with $(NH_4)_2SO_4$ for 3 years, young wheat was badly scorched. $(NH_4)_2SO_4$ should not be used on the red laterite soils of the northern and eastern Transvaal and Natal. $Ca(NO_3)_2$ or NH_4NO_3 is recommended. Annual applications of 800 lb./morgen of super. did not acidify the soil.

[911] 631.841.8
MUNSON, E. P. **Anhydrous ammonia as fertilizer.** *Sug. Bull.* 25, 1947 (196). *Sugar* 42 (52).

The Mississippi Agricultural Experiment Station and the T.V.A. have developed a system for applying anhydrous ammonia (liquified ammonia gas), and in the spring of 1947 it was used on about 100,000 acres. The necessary equipment is best made by modifying one of the machines now in use for flame cultivation. Large increases in yield have been obtained.

[912] 631.841.8
MAIER, E. A. **Aqua ammonia for sugar cane.** *Sugar* 42, 1947 (30-32).

Aqua ammonia is a new fertilizer in liquid form containing about 31% of NH_3 that, it is claimed, has given trial results comparing favourably with those of dry fertilizers. The method and machinery for distributing the fertilizer to the cane row are described. Both aqua and anhydrous ammonia should

be covered immediately after application to a depth of at least 6 inches. For sugar cane, the cost of N in aqua ammonia delivered at the plantation is at present slightly more than half the cost of N in dry N-carrying fertilizer.

[913] 631.841.8
ANDREWS, W. B.; EDWARDS, F. E.; HAMMONS, J. G. **Ammonia as a source of nitrogen.** *Miss. Agric. Expt. Sta. Bull.* 448, 1947, pp. 21.

Anhydrous NH_3 and aqua ammonia are equal to or superior to NH_4NO_3 for row crops and are more easily applied at depths of 4-6 inches than are solid sources of N. Ammonia will kill germinating seed and should be placed 4-6 inches below the planting depth. Equipment for storing and applying ammonia is described.

631.85 PHOSPHATE FERTILIZERS

(See also Abs. Nos. 952, 956)

[914] 631.85
WILLIAMS, E. G.; REITH, J. W. S. **The relative effectiveness of phosphatic fertilizers.** *Emp. J. Expt. Agric.* 16, 1948 (1-13). [Macaulay Inst. Soil Res., Aberdeen]

The effectiveness of the high-temperature phosphates, dicalcium phosphate, reverted phosphates, metaphosphate and phosphates in granular form were investigated by field and pot experiments on acid soils of different geological origins. Mineral phosphates were included to provide an extreme contrast to super. The main feature of the results was the absence of major differences in the over-all effectiveness of phosphates, other than mineral phosphates, Semsol and metaphosphate, which were generally less effective than the others. There was a distinction in efficiency between materials of low citric solubility and citric-soluble forms such as silicophosphate and dicalcium phosphate. Too much emphasis has been placed in Britain on water-solubility as a criterion of manurial value. Granulation did not cause any significant difference in the effectiveness of super. Soils of different geological origins had no appreciable effect on the relative efficiency of different phosphates. Placement of applied P appears to have more influence on its efficiency than the use of different forms of phosphate.

[915] 631.85 : 546.185-33 : 631.813
MACINTIRE, W. H. ; SHAW, W. M. ; HARDIN,
L. J., ET AL. **Differential effects of
various calcium carriers upon trans-
itions in phosphate mixtures.** *Soil Sci.*
65, 1948 (27-34).

A general discussion of the effects of adding limestone, dolomite, calcined dolomite, slags, etc., to phosphatic fertilizers. Ca meta-phosphate was under all conditions superior to equivalent quantities of CaCO_3 , both as a liming material and when added to super.

[916] 631.85 : 631.416.2
BARBIER, G. ; CHABANNES, J. ; MARQUIS, A.
Utilisation des engrais phosphatés par les
plantes, après leur absorption dans le sol.
[Utilization of phosphatic fertilizers by
plants, after their absorption in the soil.]
Plant and Soil 1, 1948 (11-17). [F.] [Sta.
Cent. Agron. Versailles]

A slightly acid medium loam was treated annually with a fixed amount of P as super. or basic slag, and cultivated but not cropped. The acid-soluble-P content rose by decreasing amounts for the first five years and then maintained a steady level until treatment was stopped in 1941, 14 years after the beginning of the experiment. In 1944 the soil was used for pot cultures of barley and its effect on yield was similar to that of soil to which an equivalent amount of P was applied immediately before sowing, thereby indicating that the P was not irreversibly fixed in the soil. The selective absorption of PO_4 by plants was demonstrated by growing maize and barley in divided jars so that half the roots of each plant grew in one compartment and half in another. In one series both compartments were supplied with low concentrations of P and in another series one compartment contained a high, and one a low, concentration of P. The plant absorbed less P from the low-concentration compartment in the second series than from one of the compartments in the first series, thereby suggesting that the soil reserves provide less P in the presence than in the absence of fertilizers.

The existence of an absorption complex consisting of clay, Ca and PO_4 ions, as distinct from Ca phosphate, is confirmed by various observations. Consideration of the significance of this complex in relation to the results with loam soil suggests that

"fixation" of PO_4 consists of an evolution from a form extractable by dilute acids to one extractable by dilute alkalies, but that loss of acid-solubility does not necessarily involve loss of availability. It is generally concluded from the study that, for certain soils, if a fraction of the soluble P applied to the soil does become completely and definitely inert, that fraction is fairly small.

[917] 631.85 : 631.416.2 : 631.821.1
SELL, O. E. ; OLSON, L. C. **The effect of
surface applied phosphate and limestone
on soil nutrients and pH of permanent
pasture.** *Proc. Soil Sci. Soc. Amer.* 1946, 11,
1947 (238-245).

Applying dolomitic limestone and P fertilizers to the soil surface instead of incorporating them into the ploughed layer resulted in the establishment and maintenance of productive pasture clovers in Bermuda-grass sod on a Cecil sandy loam which had been unfertilized and unlimed for 15 years. Top-dressing with limestone increased the pH and available Ca and Mg to a depth of 12 inches, decreased the soluble Al and increased the penetration of available P, but the depth of P movement depended mainly on the quantity of P applied, heavy dressings causing penetration to 12 inches. Supplementary irrigation in dry periods increased the pH and available Ca and Mg at all depths, also the penetration of P, but this effect was masked by increased plant growth with consequent greater nutrient removal. The use of N and K also tended to reduce the penetration of P for the same reason. The P in rock phosphate and basic slag penetrated deeper than that from super. and mono-ammonium phosphate.

[918] 631.85 : 631.461.5
PARR, C. H. **The role of phosphate in
mixed farming.** *Indian Farm.* 7, 1946
(512-516).

By stimulating the growth of legumes, P stimulates N fixation in the soil and so builds up soil fertility.

[919] 631.851 : 631.812
GETHIN JONES, G. H. **A method for the
preparation of silicophosphate on farms.**
E. Afric. Agric. J. 13, 1948 (139-146).

P fertilizer with a high content of "citric-soluble" P_2O_5 can be prepared by heating

Uganda rock phosphate and Magadi ash at a temperature of 850-900°C, the time of heating required depending on the mass of the units used. A simple kiln-burning method, resembling that of brick making, is described.

[920] 631.854.56-1.81
BAHRT, G. M.; POTTER, G. F. **Effects of nitrogen, phosphorus and potassium on growth and yield of tung trees and composition of fruits.** *Proc. Amer. Tung. Oil Assoc.* Pt. 1, 1947 (28-33). C.A. 42 (308).

High-N fertilizer applications to bearing tung trees increased the fruit yield and percentage of kernel in the whole fruit, but decreased the oil content of the kernel significantly. The percentage of oil in the whole fruit was not affected. P had no effect on the growth, composition or production of the fruit. K increased the oil content of the kernel.

[921] 631.855:66.095.1
GUSEINOV, D. M. **[Organic phosphate fertilizer from the waste products of the petroleum industry: acid sludge—and its effect on agricultural crops.]** *Bull. Acad. Sci. U.S.S.R. (Cl. Sci. Math.) Sér. Biol.* No. 1, 1945 (92-100). C.A. 42 (2044). [R.e.]

Phosphate fertilizer was prepared by substituting acid sludge for H_2SO_4 . Apatite (100 kg.) and sludge (150 kg., 25-70% acid) were mixed in a kettle for 15-20 minutes, 150 kg. of solvent (gas oil, or cracking kerosene) was added, the whole agitated for 20-25 minutes and the liquid poured off; the solid residue contained about 14% available P and 15% organic material. This fertilizer produced better yields than super. The solvent from the liquid portion was recovered for re-use and the residue was suitable for fuel.

[922] 631.859.1:631.816.3
ROSS, W. H.; WHITTAKER, C. W.; ADAMS, J. R., ET AL. **Influence of placement of ammoniated and non-ammoniated superphosphates on efficacy of the phosphate.** *J. Amer. Soc. Agron.* 40, 1948 (125-135).

The effects of placement on the response of millet, Sudan grass and sorghum in pots to non-ammoniated super. and super. ammo-

niated to 2-5% were studied in one alkaline soil fairly rich in available P and 6 acid soils low in P. The placements were (1) fertilizer mixed with all the soil, (2) fertilizer mixed with 5% of the soil and placed in a horizontal layer half way down the 2-gallon pots, and (3) fertilizer, unmixed with soil, applied as a circular layer of 3 inches diameter $1\frac{1}{2}$ inches below the surface, or as a continuous band $\frac{1}{2}$ inch wide and 2 inches below the seed.

On the acid soils, placement (1) was the least effective for both types of P. With ammoniated super. (2) gave superior results to (3), particularly with higher rates of ammoniation, whereas with non-ammoniated super. (2) was from slightly to markedly inferior to (3) in 5 cases, especially at the lower rates of application, was about equal in 3 cases, and superior in 2. On the alkaline soil, the results were similar but less definite.

631.86/7 ORGANIC FERTILIZERS

[923] 631.86/7:631.81
INSTITUT FÜR PFLANZENBAU UND PFLANZENZUCHTUNG, BRESLAU. **Ein weiterer Beitrag zum Problem der Fruchtbarkeit unserer Böden. [A further contribution to the problem of the fertility of our soils.]** *Ztschr. Pflanz. Düng.* 39, 1947. (10-27). [G.]

A deep fertile loam rich in organic matter and under the rotation roots-cereal-cereal received manure with the root crop at the rate of 200-1600 dz./ha. and the following cereal crop received 2.8 dz./ha. of both $NaNO_3$ and basic slag, and 1.2 dz./ha. of 40% K salts. The root crop on the otherwise unmanured control received artificials equivalent to the manurial dressing of 400 dz./ha. The yields of roots and of cereal grain and straw increased progressively and greatly above those of the control over the 11 years of the experiment. The optimum dressing was 800 dz./ha., while 200 dz./ha. gave unsatisfactory results. The soil pH remained at about 6.4, and the content of root-soluble P and K and of humus and Ca showed slight to large increases.

[924] 631.871:547.458.84
ARIES, R. S. **The use of lignin as a soil builder.** *Northeast. Wood Util. Council. Bull.* 19, 1948 (79-122).

The beneficial effects of lignin additions to soils are discussed and the literature on plant decomposition and the use of waste sulphite liquors and wood waste as fertilizers is reviewed. A description is given of work in progress on the effect of lignin on soil structure, water infiltration, soil composition, lima beans, potatoes, peanuts, sweet potatoes, soybeans and maize. 57 references.

[925] 631.871 : 632.556:7
WATSON, E. F. **Utilisation of water hyacinth.** *Indian Farm.* 8, 1947 (29-30).

Water hyacinth makes a good compost if after wilting for 1-2 weeks it is stacked in a bamboo framework and mixed with fresh manure and wood ashes or fine soil. After about 3 weeks the heap begins to cool and should be re-stacked. The compost is ready in 3 months.

[926] 631.874 : 633.37
INFORZATO, R. Nota sobre o sistema radicular do guandu, *Cajanus cajan* (L.) Millsp., e a sua importância na adubação verde. [Note on the root system of the guandu, *Cajanus cajan* (L.) Millsp., and its importance as green manure.] *Bragantia* 7, 1948 (125-127). [Pt.]

This legume, grown in rows 50 cm. apart, at intervals of 10 cm. in the rows, provided 6185 kg. of roots per ha. in the top 30 cm. of soil and a further 630 kg. evenly distributed in the 30-295 cm. layer. The shoot material from 1 ha. weighed about 87,000 kg. It may be used as green manure or green forage.

[927] 631.876.9 : 633.61
IWATA, Y.; WU, T. S. **Compost from bagasse.** *Taiwan Sug. Expt. Sta. Rept.* 1, 1947 (119-126). C.A. 42 (1008).

Bagasse was treated with lime and water for 2 weeks, mixed with $(\text{NH}_4)_2\text{SO}_4$ or dung, and turned at intervals of 170 days.

[928] 631.877
DEAS, C. P.; TARR, H. L. A. **Amino acids in fishery products.** *Fish. Res. Bd. Can., Prog. Repts. Pacific Coast Stas.* 73, 1947 (50-52). C.A. 42 (2032).

Stickwater, a potentially valuable by-product of the fish-meal industry, contains a fair proportion of the essential amino acids. The waste waters from vitamin-oil

extraction processes are almost equal to stickwater as a source of amino acids and for use as fertilizers.

[929] 631.879.2
PILLAI, S. C.; RAJAGOPALAN, R.; SUBRAHMANYAN, V. **Growing fodder crops on sewage.** *Indian Farm.* 8, 1947 (191-192).

Even treated sewage gives the best response only after dilution. The soil requires liming and periodical rest after being treated with sewage. Filtered sewage is deficient in P which has to be made up either from dried sludge or from some other source. Growing market-garden crops on sewage has been shown not to be always satisfactory, as these crops tend to become polluted and to produce digestive and other disorders. Animals are quite resistant to sewage pollution, and can be safely reared on sewage-grown crops. Grass is recommended as a suitable crop for sewage fertilizing, although the returns are not so rapid as with vegetable crops.

632 PLANT DISEASES. WEEDS AND PESTS. PLANT PROTECTION

(See also Abs. Nos. 881, 953, 981, 989, 990, 991, 1037)

[930] 632.192 : 546.711
FUJIMOTO, C. K.; SHERMAN, G. D. **The effect of physical treatments on the fixation and release of manganese in Hawaiian soils.** Abs. in *Proc. Hawaii. Acad. Sci.* 21, 1946 (8-9). R.A.M. 27 (154-155).

Samples taken from soils carrying chlorotic trees of *Macadamia ternifolia* had a higher content of exchangeable Mn than those from areas bearing normal trees. A gradual increase in the percentage of exchangeable Mn occurred when the soils were air-dried, while oven-drying and steam sterilization raised the fraction from a few to 3000 p.p.m. The distribution of Mn in the soil appeared to be influenced by oxidation-reduction relations and by dehydration and hydration.

[931] 632.2 : 632.953
AGRICULTURAL CHEMICALS. **Nematode control.** *Agric. Chem.* 3, No. 1, 1948 (45).

Benzene hexachloride had no effect on the control of root knot on sandy loam low in

organic matter and heavily infested with nematodes. 25, 75, 225 and 675 lb./acre were mixed with 2 gallons of soil and broadcast over the surface of the plot which was then disced 6 inches deep. Soil moisture was fairly high and temperature at 3 inches deep was 86°F. Almost all plants treated at the 675-lb. rate died soon after emergence. Root systems of surviving plants were small and affected by root knot. Material in the soil was toxic to plants for at least 2 months.

[932] 632.595:26
ESPINO, R. B. Eleven years' study on "buñga ñg tubo": a résumé. *Philipp. Agricst.* 31, 1947 (151-153).

Extensive research on "buñga ñg tubo," *Aeginata indica* L., a root parasite of sugar cane, has been carried out, but the resulting data were destroyed by enemy action. On the basis of those findings which can be recalled, methods of eradication are recommended. Burning the trash destroys the seeds at the soil surface and stimulates the germination of the remaining seeds which can then be eliminated. Ratooning should be avoided and the stubble removed if infection is severe. The parasite may be ultimately eradicated if the infected roots are detached when the buñga flowers appear. Introduction of seeds into the plantation by irrigation water may be lessened by eradication of secondary hosts such as *Imperata exaltata* from river banks.

[933] 632.7: 631.44
FERRIERE, C. L'abondance des doryphores en rapport avec la nature du terrain. [The abundance of the Colorado beetle in relation to soil conditions.] *Rev. Romande Agric. Vitic.* 1, 1945 (1-2). Hort. Abs. 17 (278).

The Colorado beetle is most abundant on recent alluvial or quarternary soils, sand and gravel mixed with clay, that is, on horizontal situations at the bottom of valleys or on the sides of streams. It is less abundant on sandy clay or gravel from ancient moraines unless the ground is deep and humid. It is rare on soft sandstone or marly soils more or less clayey and shallow.

[934] 632.765: 632.953
KULASH, W. M. Soil treatment for wireworms and cutworms. *J. Econ. Ent.* 40, 1947 (851-854). [N.C. St. Coll., Raleigh]

A DDT-sand mixture containing 5% DDT and used at the rate of 500 lb./acre protected maize plants from the smaller stages of cutworm, but did not control the older forms or wireworms. DDT and benzene hexachloride dusts may be safer than wettable forms. Seed germination was retarded when heavy applications were made in the form of a dust or a liquid suspension.

632.95 FUNGICIDES. INSECTICIDES. HERBICIDES

(See also Abs. Nos. 931, 934, 945, 979)

[935] 632.951
BONNEMAISON, L. Sur une nouvelle méthode de lutte chimique à appliquer contre les taupins. [A new chemical method against spring beetles (*Agriotes*).] *C.R. Acad. Agric.* 34, 1947 (174-176). [F.]

Soil treatment against the larvae is much inferior to dusting, after the first cut, the lucerne and clover crops in which the adults congregate for pairing. Hexachlorocyclohexane (8%), DDT (5%), nicotine (2%) and rotenone (0.65%) at 10-15 kg./ha. of the commercial product give 90-100% control and cause no harm to soil organisms.

[936] 632.953
SMITH, M. S. Persistence of D.D.T. and benzene hexachloride in soil. *Nature* 161, 1948 (246).

D.D.T. and benzene hexachloride were incorporated at a concentration of 2% with acid and alkaline soils. Even after 18 months more than 95% of the D.D.T. and 80-94% of the benzene hexachloride could be recovered from the soil. Only traces of inorganic chloride were found, and no changes in pH were observed. Neither D.D.T. nor benzene hexachloride seems to affect bacterial populations. The concentration of insecticide used was considerably greater than would be used in practice, but D.D.T.-treated soils permitted normal germination and early growth of cress, oats and wheat. Soils treated with benzene hexachloride inhibited root development, and oats and wheat were particularly susceptible; even when the concentration was reduced to 0.02% the growth of the radicle was suppressed.

[937] 632.953 : 547.223.1
NEWHALL, A. G. ; LEAR, B. **Soil fumigation for fungus control with methyl bromide.** *Phytopath.* 38, 1948 (38-43). [Cornell Univ.]

A 12-hour treatment of soil in gas-proof drums with methyl bromide at the rate of 12 ml./cu. foot, followed by a similar period of aeration is sufficient for fungus control. So far methyl bromide has been proved effective only against damping-off fungi and sclerotia of *Sclerotinia sclerotiorum*, but it may be effective against nematodes.

[938] 632.953 : 631.414.3
FUHR, I. ; BRANSFORD, A. V. ; SILVER, S. D. **Sorption of fumigant vapors by soil.** *Science* 107, 1948 (274-275). [Gussing Sect., Med. Div. Army Chem. Center, Md.]

Soil had little effect on methyl bromide, carbon monoxide and carbon disulphide. The effectiveness of the latter two rodenticides is due to a considerable degree to their low sorbability by soil. H_2S , HCN , SO_2 and phosgene were markedly sorbed by the soil. Calcium cyanide is often satisfactory because in practice a large excess is used.

[939] 632.953 : 631.432.2
SCHMIDT, C. T. **Dispersion of fumigants through soil.** *J. Econ. Ent.* 40, 1947 (829-837). [Pineapple Res. Inst., Honolulu]

The movement of chloropicrin and D-D mixture in the soil was measured, using the percentage mortality of the rice weevil as the criterion for the presence and concentration of the vapours. Both vapours rose to high initial concentrations and then diminished slowly. Chloropicrin was more efficient in dispersion and its retention time in the soil was greater than that of D-D mixture. Vapour movement was most rapid in medium moist soil, less rapid in dry soil and least rapid in very wet soil. Retention in the soil followed the same order. Increased depth of injection extended the retention time of the vapours but reduced the efficiency of the vapours near the soil surface, particularly with D-D mixture.

[940] 632.954
CHEMICAL AND ENGINEERING NEWS. **Weed killers being tested.** *Chem. Engng. News* 26, 1948 (196).

Na isopropyl xanthate and allyl mixed chlorophenyl carbonate have given good results against many weeds and grasses. The former, which is non-selective, has been used successfully for pre-emergence treatment and as a defoliant for cotton or nursery stocks. Allyl mixed chlorophenyl carbonate is selective and effective against certain grasses such as crab, barnyard, orchard, blue grass and cattails.

[941] 632.954 : 577.17
MANGUAL, J. C. **Increase of herbicidal action of Concentrate 40 and oil emulsion by 2,4-D.** *Science* 107, 1948 (66). [P.R. Fed. Expt. Sta., Mayaguez]

Concentrate 40 + 2,4-D, consisting of 0.42% As_2O_3 , 0.25% Na pentachlorophenate, 0.25% $NaClO_3$ and 0.10% 2,4-D, suppressed the population of *Commelina longicaulis* and *Ipomea* spp. more than either Concentrate 40 or 2,4-D alone. Similar results were obtained with 10% diesel-oil emulsion fortified with 0.7% pentachlorophenol + 2,4-D. The addition of 2,4-D to Concentrate 40 also increased its herbicidal action against Bermuda grass by 50%, although this weed is unaffected by 2,4-D alone and is very resistant to As compounds.

[942] 632.954 : 577.17
NORMAN, A. G. **Agronomic uses for plant growth-regulators.** *J. Amer. Soc. Agron.* 40, 1948 (111-119).

Soil applications should provide the main developments in the immediate future in weed control in crops and seed-production plots. Methods under test are seedbed treatment with "anti-germinants" before or at sowing, pre-emergence treatment and post-emergence treatment using protective hoods over sensitive row crops. Less broadly effective compounds than 2,4-D may be preferable as anti-germinants. Considerable increases in acre-yields may be obtained from crops such as maize whose spacing is at present determined by the need for mechanical intertilling.

[943] 632.954 : 577.17 : 631.445.7
VAN OVERBEEK, J. **Use of synthetic hormones as weed killers in tropical agriculture.** *Econ. Bot.* 1, 1947 (446-459).

A review of development and a forecast of possible future developments in the use of hormone herbicides with particular reference to Puerto Rico.

[1944] 632.954 : 631.445-7
CRAFTS, A. S. **Weed control in the tropics.** *Science* 107, 1948 (196-197). [Agric. Expt. Sta., Rio Piedras, Puerto Rico]

Neither nutgrass nor *Commelina* responds favourably to 2,4-D. 30 lb. of medium-gravity highly aromatic oil + 2-4 lb. of pentachlorophenol + 2 lb. of Oronite wetting agent in 95 gallons of water is a satisfactory oil-emulsion contact spray for all green vegetation, but *Ipomoea*, *Commelina* and nutgrass will resprout. It will not kill cane, coffee, pineapple or banana plants if used only around the bases and kept off the leaves.

1 lb. of 2,4-D added to the above formula will kill most weeds of tropical crops. A spray of 2 lb. of pentachlorophenol dissolved in 1 gallon of highly aromatic oil mixed with 100 gallons of diesel fuel or other light oil will kill *Panicum purpurascens* and *Trichachne insularis* in drainage and irrigation ditches.

633.1 CEREALS

(See also Abs. Nos. 801, 1044, 1053, 1061)

[1945] 633.1-2.954 : 577-17
PEDERSEN, A. ; ANDERSEN, S. ; HERMANSEN, J. **Hormonderivaternes Virkning paa Kulturplanterne. I. Sprøjtning af Byg og Havre med 2,4-D og 4K-2M. [Effect of hormone derivatives on cultivated plants. I. Spraying barley and oats with 2,4-D and 4K-2M.]** *Kgl. Vet. Landbohøjsk. Afd. Landbr. Plantedyrk. Medd.* 25, 1948 (101-147). [Da.e.]

On barley, sprays of 1 kg./ha. of 4K-2M (2-methyl-4-chlorophenoxyacetic acid) and 2,4-D had little influence on yield or quality, but 10 kg./ha. of 2,4-D was harmful. Large doses of both caused abnormalities in the structure of the plants, especially after spraying at tillering stage. With oats, yields decreased after spraying with 1 kg./ha. and continued to decrease with increasing doses. Quality was reduced only with doses of 16 kg./ha., and reduction was greater with 2,4-D than with 4K-2M. 64 kg./ha. reduced the yield to 0 and 15% after dressing with 2,4-D and 4K-2M respectively. Using the same doses of Na salt, 2,4-D had a greater effect than 4K-2M. The period of susceptibility lasted longer with oats than with barley.

[1946] 633.11-1.581-1.81
CYPRUS DEPARTMENT OF AGRICULTURE. **Permanent fertilizer trials.** *Cyprus Dept. Agric. Rept.* 1946, 1947 (8-9).

Plots on which wheat had been grown continuously under varying fertilizer treatments for 13 years had become infested with weeds and were left fallow for one season. In the following year on plots that had received no manure for 13 years the wheat yield was equal to that of crops in the normal cereal-fallow rotation. Small dressings of N and P after the fallow gave as good yields as had previously been obtained with 4 times the amount of fertilizer under continuous cropping.

[1947] 633.11-1.582 : 581.192
CHAMPLIN, M. ; WALL, A. **The effect of crop sequence upon the yields and quality of Marquis wheat.** *Sci. Agric.* 27, 1947 (593-599). [Univ. Sask., Saskatoon]

Continuous crops of wheat were compared with those in various rotations. These were:—O1, fallow, wheat; O2, maize in hills, wheat; O3, oats in rows, wheat; T1, T2 and T3 as O1, O2 and O3 with sweet clover after wheat; N1, fallow, wheat, oats in rows, wheat, lucerne, lucerne; N2 and N3 as N1 with brome grass and slender wheat grass, respectively, substituted for lucerne; A, fallow, wheat, maize, oats, sweet clover; I, fallow, wheat, oats, lucerne; S, fallow, wheat, oats. The continuously cropped wheat and that in rotations O, T and N were treated with 6 tons/acre of manure once in 6 years. Results are expressed as averages over 20 years.

Manure on continuous wheat increased yields by 0.8 bu./acre, the protein content by 0.7% and the weight/bu. by 0.4 lb. The highest yields (33.3 bu./acre) were obtained in I followed by O1 (32.4 bu./acre). N3 produced 29.8, N2 27.0 and N1 26.4 bu./acre. In O and T where different methods of moisture conservation were compared, yields indicated that fallow was the most, and oats in double rows the least, efficient, although the value of the row crops plus that of the wheat exceeded that of wheat grown on fallow. Inclusion of sweet clover in the rotation (T) depressed yields below those of O. The desirability of introducing a legume into the system is suggested by the production of less grain in S than in I, T and A, while the superiority of A and I over T and N1 indicate suitable sequences. Average protein content was increased by the introduction of a legume while weights per bu. and per 1000 kernels were influenced by

moisture, being higher after fallow or maize than after oats in rows.

[948] 633.11-2.4-1.58
STOREY, I. F. **Observations on take-all and eyespot diseases of wheat in Yorkshire.** *Ann. Appl. Biol.* 34, 1947 (546-550). [Univ. Leeds]

A survey of Yorkshire wheat crops from 1944 to 1946 showed the presence of *Ophiobolus graminis* and *Cercospora herpotrichoides*. Both diseases were encouraged by too frequent cropping with wheat or barley. Oats were preferable to wheat or barley as the nurse crop of a 1-year ley, and late ploughing considerably reduced the amount of eyespot present in the following wheat crop. A 2- to 3-year ley is considered more desirable than a 1-year ley.

[949] 633.11-2.4-1.81
EL-HELALY, A. F. **The prevention of black stem rust of wheat.** *Phytopath.* 38, 1948 (161-184). [Farouk I Univ., Alexandria]

The kernels of wheat sown at the beginning of October were nearly mature when stem rust (*Puccinia graminis* Pers.) appeared, and a normal yield was obtained. Kernels of wheat sown in December, however, developed at the same time as the disease and shrivelled, causing a large decrease in yield. Increase in the number of waterings resulted in heavy attack by rust and promoted spore germination, but a single watering provided insufficient moisture for good yields. Comparison of treatments with $\text{Ca}(\text{NO}_3)_2$, K_2SO_4 , super. and farmyard manure showed higher yields with the N fertilizers, but little differences in disease incidence. In experiments where $\text{Ca}(\text{NO}_3)_2$ only was added, infection was more severe on the manured plots. Various fungicides were also tested.

[950] 633.13-1.811.3
BOTTINI, E. **Potassium assimilation (by oats) and its relation to plant growth.** *Ann. Sta. Chim-Agrar. Torino* 14A, 1940 (85-112). C.A. 42 (707).

Experiments in pots containing sand mixed with a constant quantity of fertilizers and increasing quantities of K_2O showed that absorption of K by plants is nearly proportional to the concentration of K in the pot soil. Plant growth is proportional to K assimilation only in the first stage of plant life; successive stages depend mostly on

N absorption for which small amounts of K in the plant are sufficient. Absorption of P_2O_5 increases with increasing K_2O in the soil.

[951] 633.13-2.19
GISIGER, L.; HASLER, A. **Neuere Beobachtungen über die Ursachen der Dörrfleckenkrankheit beim Hafer. [New observations on the causes of grey-speck disease of oats.]** *Plant and Soil* 1, 1948 (18-50). [G.] [Bern]

Investigations made during the war to control grey speck without Mn (which was in short supply) indicated that Mn deficiency was the direct cause, especially at weakly acid to weakly alkaline reactions. Grey speck was induced in pot experiments with healthy, weakly acid moor soils by applying CaO, but very large doses prevented the disease from occurring. B, given together with CaO, increased the incidence of grey speck in doses up to 50 kg./ha., but larger doses counteracted the unfavourable effects of the CaO. It is suggested that large doses of B promote the uptake of Mn by oats. Additions of increasing amounts of K_2O to healthy moor soil likewise caused first an increase and then the disappearance of the disease.

These phenomena indicate the predominant importance of the OH concentration in causing the disease to appear; it is possible that the favourable effect of B may be due to it counteracting the swelling effect of OH on plant plasma. The CaO: K_2O ratio seems to have some influence on the incidence of grey speck, but it is of secondary importance to the OH concentration.

[952] 633.15-1.85: 581.192
WEEKS, M. E.; WALTERS, A. **The effect of phosphorus fertilization on chemical composition and forms of phosphorus in mature corn crops.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (189-194).

Plots of a moderately acid soil low in total P were treated with manure and varied amounts of super. or rock phosphate, lime being added on some plots. The untreated control plot yielded 9.1 bushels of grain per acre, whereas plots receiving manure+super. or manure+lime+super. averaged 63.3 bu./acre.

The composition of grain varied less than that of stover for all nutrients, but the

increase in P content varied from 12 to 55% in grain and from -5 to 77% in stover, the smaller values coming from plots previously without super. for 16 years, and the larger from plots consistently fertilized with P. In grain, 5% of the P is inorganic, 2.5-4.5% is phospholipid and 78-84% is in the form of phytin, whereas in stover 40% is inorganic, 3% is phospholipid, 9-20% is acid-soluble organic and about 40% is residual P.

[1953] 633.15-2.7-2.953
QUESTEL, D. D.; CONNIN, R. V. A chemical treatment of soil which produces plant tissue lethal to European corn borer. *J. Econ. Ent.* 40, 1947 (914-915). [U.S.D.A. Bur. Ent.]

o, o-diethyl o-p-nitrophenyl thiophosphate applied to the soil at the time of maize planting or during the growing period, is taken up into the stalk and leaves and serves as a protection from attack by European corn borer. Leaves were not very toxic after a week, but a week later all the larvae feeding on leaves or stalks were killed. The treatment caused no observable injury to the growing maize, but there is no information on the effects of the chemical on seeds or on the minimum quantities necessary to render the plants toxic.

[1954] 633.17-1.582
TEXAS AGRICULTURAL EXPERIMENT STATION. Crops following grain sorghum. *Tex. Agric. Expt. Sta. Rept.* 1946, 1947 (33-34).

Grain sorghums reduce the yields of following crops unless 6 months intervene between ploughing-under the sorghum and planting the next crop. Wheat, oats or barley should not follow sorghums. Average 5-year yields per acre of crops following sorghum and maize were: maize 23.6 and 23.2, wheat 17.5 and 22.3, oats 49.5 and 57.5, barley 31.2 and 37.7 bushels and cotton 281 and 286 lb. of lint.

[1955] 633.18-1.81
TEXAS AGRICULTURAL EXPERIMENT STATION. Rice fertilizer studies. *Tex. Agric. Expt. Sta. Rept.* 1946, 1947 (28-29).

Rotation of rice with *Sesbania* gave the largest yield of 2191 lb./acre of rough rice; in rotation with *Alyce* clover the yield was 1568 lb./acre. P_2O_5 alone did not increase yield, but 40 lb./acre of N increased yield

by 713 lb., 60 lb./acre by 1080 lb. and 120 lb./acre by 2000 lb. The largest increase in yield was from an application of 40 lb./acre each of N and P+K. Applications of N to rice at seeding gave better results than later applications; $(NH_4)_2SO_4$ and cyanamide gave similar results. Uramon, $(NH_4)_2SO_4$, cyanamide, NH_4NO_3 , $NaNO_3$ and $(NH_4)_2SO_4 + NaNO_3$ were applied at rates to supply 60 lb./acre of N. Uramon gave the highest yields, $(NH_4)_2SO_4$ the second highest and $NaNO_3$ the lowest.

[1956] 633.18-1.859.1
RHIND, D.; U TIN. Results of the continuous use of an ammonium phosphate fertilizer on rice in Lower Burma. *Nature* 161, 1948 (105-106). [Dept. Agric., Burma]

Rice was grown continuously from 1930 to 1940 on an acid alluvial soil, and fertilized with 100 lb./acre of ammonium phosphate every year. Yields from the fertilized plots were always significantly higher than from unfertilized, but after the first three years the increase in yield declined from a maximum of 1062 lb./acre in 1932 to a minimum of 321 lb./acre in 1939. No explanation is offered, but caution is advised in advocating the prolonged use of artificials without thorough field tests.

633.2/3 GRASSES. LEGUMES
(See also Abs. Nos. 802, 872, 926, 1073, 1081, 1082)

[1957] 633.2:581.143.26:631.452
SPRAGUE, V. G. The relation of supplementary light and soil fertility to heading in the greenhouse of several perennial forage grasses. *J. Amer. Soc. Agron.* 40, 1948 (144-154). [Bur. Pl. Indust., Pa. St. Coll.]

Pot plants of long-day grass species failed to head under the normal day length (10 hours) in winter. The best heading and dry weight of top growth were obtained by lengthening the daylight hours by 6 hours of supplementary lighting, or by providing 1-2 hours of supplementary lighting in the middle of the night. Winter heading (of orchard grass) did not occur under any day length unless the plants had been well top-dressed or transplanted to fresh soil when pot-bound.

[958] 633.2.03-1.67-1.81
JOURNAL OF THE DEPARTMENT OF AGRICULTURE, VICTORIA. **Irrigation investigations at the State Research Farm, Werribee.** *J. Dept. Agric. Victoria* 45, 1947 (567-577).

Results from the "watered spring-and-autumn" plots support the view that frequently watered pasture does not take full advantage of heavy dressings of super. The "watered-as-required" system of irrigation is the most efficient, particularly when pastures are top-dressed liberally with super. Provision of more penetrating irrigations at wider intervals will compensate to a marked degree for inability to irrigate frequently. This applies only when the soil is not very permeable. Regularly watered plots show a better grass-clover balance, and a much lower percentage of bare space than those watered "spring and autumn." For four seasons super. was superior to all other manures or combinations of manures. N and K without super. gave no better results than no manure. There was no significant increase on irrigated-pasture plots receiving K in addition to 4 cwt. of super. over those receiving 4 cwt. of super. alone.

[959] 633.2.03-1.81
DICKEY, P. B.; HOG LUND, O. K.; MADSON, B. A. **Effect of fertilizers on the production and season of use of annual grass range in California.** *J. Amer. Soc. Agron.* 40, 1948 (186-188). [S.C.S. Pleasanton, Calif.]

A mature marine-terrace gravelly clay loam in the 16-inch rainfall belt, that had been grazed for 25 years after 20 years of the alternate crop-fallow system and had lost 25-75% of its top-soil by erosion, was fertilized with ammonium phosphate-sulphate (16-20-0) at 200 lb./acre applied in late autumn after the first effective rain. Range readiness was advanced by 7 weeks by this treatment and hay production rose from 1259 to 3755 lb./acre—an increase equivalent to 3.12 animal-unit-months. The stubble was considered sufficient to provide erosion control.

[960] 633.2.03-1.81
TRUMBLE, H. C. **Some factors affecting the nutrition of herbage plants.** *J. Aust. Inst. Agric. Sci.* 13, 1947 (198).

Availability of P decreases with increasing dryness of soil, leading to reduced P content and high N content of plants under dry conditions. Availability of P seems to increase with rising temperatures and/or improved light. Availability of K and Zn is governed partly by length of daylight. Availability of Cu, Zn, Mn and Mo is affected by soil pH, Mo differing from the others in being more readily available as pH increases. Under pasture on acid soil, availability of Mn may increase to a condition of toxicity.

[961] 633.2.03-1.84 : 581.192
FERGUSON, W. S. **The effect of late nitrogenous top-dressing on the digestibility of hay.** *J. Agric. Sci.* 38, 1948 (33-35). [I.C.I. Ltd., Jealott's Hill Res. Sta., Bracknell]

The composition and digestibility of hays from good ley and poor permanent grass were investigated. Untreated hay was compared with that top-dressed 8-13 days before cutting with 2 cwt./acre of $(\text{NH}_4)_2\text{SO}_4$ or 3 cwt./acre of nitro-chalk. Top-dressing did not result in higher yields, but in increases of 1.18 and 1.22% of true (Cu-precipitable), and of 1.90 and 2.05% of crude, protein in hays from the ley and permanent grass respectively. Both types of protein were more digestible and protein-equivalent values were higher in top-dressed than in untreated hay. Differences in starch-equivalent values were insignificant. An additional advantage of late N top-dressing is its stimulating effect on the growth of the aftermath.

[962] 633.262-1.81
SWALLERS, C. M.; STOA, T. E. **Influence of fertilizer and other treatments on old brome sod.** *N. Dak. Agric. Expt. Sta. Bull.* 9, 1947 (67-69). *Biol. Abs.* 21 (2022).

To relieve sod-bound conditions and low production in an old brome grass, plots were treated (1) with $(\text{NH}_4)_2\text{SO}_4$, (2) with super., (3) with a mixture of super. and $(\text{NH}_4)_2\text{SO}_4$, (4) with fresh barnyard manure and (5) by cultivation alone. None of the treatments stimulated head formation during the year of treatment. During the third year, N fertilizer increased the forage yield, more where $(\text{NH}_4)_2\text{SO}_4$ was used than where either manure or super. was added. Cultivation resulted in fewer heads as well as

lower forage yield. The residual effects of the treatments during the second and third year indicate the desirability of manure over commercial fertilizer.

[963] 633.287-1.81
POTTS, R. C. ; HANSEL, R.L. **Rhodes grass in Texas.** *Tex. Agric. Expt. Sta. Circ.* 116, 1947, pp. 17.

On sandy soils in humid areas 400-500 lb./acre of complete fertilizer and 300 lb./acre of NaNO_3 should be applied.

[964] 633.3 : 581.192
MILES, I. E. **The storage of nitrogen by different legumes.** *Miss. Agric. Expt. Sta. Circ.* 126, 1946, pp. 10.

Leguminous plants differ widely in their ability to store N. With every legume studied, 57-96% of the N occurred in the tops. Crimson clover and hairy vetch contained more than 90% in their tops and if these are removed as hay the soil becomes rapidly depleted of N. Lespedeza and kudzu are the best soil builders as they carry a higher percentage of N in their roots than any other legume studied.

[965] 633.326-1.811
ROSSITER, R. C. ; KIPPS, E. H. **The effect of potassium on the growth of subterranean clover and other pasture plants on Crawley sand. 1. Pot-culture experiments.** *Aust. J. Coun. Sci. Indust. Res.* 20, 1947 (379-388).

Seedlings of *Trifolium subterraneum* L. in pots of yellow subsoil sand were inoculated and treated with 2.7 gm. per pot of $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$, 1.0 gm. of KCl and 13.6 gm. of $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ separately and in all possible combinations. 0.68 gm. per pot was equivalent to 1 cwt./acre. A basal nutrient mixture containing Cu, Zn, Mn, B and Mo was also applied. In a second experiment the clover was grown with and without Wimmera ryegrass (*Lolium rigidum* Gaud.) in association and treated with a basal dressing of $\text{Ca}(\text{NO}_3)_2$ and with P and K at three levels. On a dry-weight basis there was a marked response to P, while CaSO_4 had a depressing effect, especially in the presence of K. The beneficial effect of K was enhanced by the higher P levels. The absolute amounts of P, K, Ca, Mg, Na, N, S and soluble ash in the clover tops were

also determined. Ca increased the relative amounts of Mg present while P increased the N content in the absence of Ca and decreased it in the presence of Ca. Association with the grass depressed the clover yield, especially where no P was added, and caused an earlier appearance of K-deficiency symptoms.

[966] 633.379-1.5
AGRICULTURA TROPICAL, BOGOTÁ. **El cultivo del kudzu tropical. [The cultivation of tropical kudzu.]** *Agric. Trop. Bogotá* 4, No. 2, 1948 (50-51). [Sp.]

The crop is drought-resisting, will grow in sun or shade on the poorest soils, is relatively unaffected by pests and diseases, rapidly smothers weeds and will support 3-4 milking cows per ha. per year or 2 in dry years. The seed is soaked in water for 24 hours and sown in hills of size 30 cm. square and 1.2 m. apart at the rate of 50 seeds per hill (10 lb./ha.). In hilly country 50 seeds per metre should be sown along the contour in furrows 90 cm. apart and 5-8 cm. deep and trodden in, either uncovered or covered by $\frac{1}{2}$ cm. of earth. In 3 or 4 months, 3-4 quintals of seed per ha. may be harvested, and will retain its germinating power for 3 years if kept in a cool dry place.

[967] 633.379-1.81
O'BRIEN, R. E. ; SKELTON, D. W. **The production and utilization of kudzu.** *Miss. Agric. Expt. Sta. Bull.* 438, 1946, pp. 25.

Kudzu is deep rooting and grows best on sandy to silt loams. It does not grow well on heavy or shallow soils or soils containing hardpan. Maximum growth of forage is produced on fertile soils. It is recommended for use on eroded land which should first be fertilized with 1-3 tons/acre of manure + 200-400 lb./acre of super. or, if manure is not available, with 300-600 lb./acre of 0-14-7 fertilizer + sufficient N fertilizer to supply 20-30 lb./acre of N. The fertilizer should be applied in furrows at least a month before planting.

633.4 ROOT CROPS

[968] 633.4-1.54
NISSEN, Ø. **Sammenligning av dyrkingsomkostninger og avling av forskjellige rotvekstarter, plantet og sådd. [Comparison of the costs of production and the yield**

of different root crops, planted and sown.] *Meld. Norg. LandbrHøysk.* 27, 1947 (165-236). [N.e.]

Experiments were carried out to determine which type of root crop and conditions of spacing and whether transplanting or thinning give the best economic results. Yields and costs of cultivation were investigated, and it was found that a spacing of 25 cm. was the most remunerative for sown crops, but that the 37.5-cm. space paid best when transplanting. The increase in yield with the latter method also exceeded that in cost.

[969] 633.4-1.84
BADISCHE ANILIN—UND SODA-FABRIK. LANDWIRTSCHAFTLICHE ABTEILUNG. Was leistet der Stickstoff im Futter- und Kohlrübenbau? [The effects of nitrogen in the cultivation of fodder turnips and swedes.] *Ztschr. Pflanz. Düng.* 38, 1947 (131-149). [G.]

A summary of the records of about 1600 experiments carried out during 17 years in all parts of Germany, concerning the effect on root and top yields of increased applications of N (60, 80 and 100 kg./ha.). A basal dressing of P and K was applied in the form customary to each district, and manure at 200 or 375 dz./ha. was given in 85% of the experiments. The averaged results show that the highest yield of turnips per kg. of N was 213.5 kg., obtained with the 80 kg. application, but the decrease in the yield per kg. of N on increasing the rate of N was offset by a continued increase in the yield of tops (35-55 kg. per kg. of N). With swedes, the highest yield was 158.6 kg. of roots from the 100 kg./ha. application, the relative smallness of the swede yield being due to their higher protein content. The experiments with both crops showed that a relative scarcity of manure can be offset by higher N applications and conversely. N, even at high rates, becomes fully utilized: when the limit of root yield is reached, any excess of N increases the top yield up to a limit, beyond which any addition of N goes to increase the protein content.

633.491 POTATOES

(See also Abs. Nos. 809, 933, 1085)

[970] 633.491-1.81
BERGER, K. C. Soil fertility investigations with potatoes in Wisconsin. Abs. in *Amer. Potato J.* 25, 1948 (47-48).

Unbalanced fertilizing of potato soils has decreased soil reaction from pH 5.5 to pH 4.5, more than trebled the available P content of the virgin soils and halved the available K. Potato yields have been increased by up to 140% by the application of 1200 lb./acre of 6-6-18 fertilizer broadcast, plus 800 lb./acre of 3-12-12 at the side of the seed in the row. An acid-induced deficiency of available Mg and excess of soluble Mn were rectified by small dressings of dolomitic limestone which increased the yields by up to 30%.

[971] 633.491-1.84 : 581.192
JORET, G.; MALTERRE, H. Observations sur l'action de la fumure azotée dans la culture de la pomme de terre. [Nitrogenous manuring of potatoes.] *C.R. Acad. Agric.* 29, 1943 (118-120). Hort. Abs. 17 (274).

The potato efficiently transforms mineral N to edible protein.

[972] 633.491-2-1.81
THOMPSON, J. C. The influence of manurial treatment on stem-end blackening of potatoes. Abs. in *Brit. J. Nutr.* 1, 1947 (xi).

King Edward and Majestic potatoes were grown under varying conditions in ground prepared with no manure, farmyard manure or straw, and treated with and without normal fertilizer, K-rich fertilizer or P-rich fertilizer. The worst blackening occurred on straw-treated and normally fertilized land. P-rich fertilizer improved King Edward potatoes, but made Majestic potatoes worse.

[973] 633.491-2.8-1.436
FELTON, M. W. The effect of temperature, moisture and nitrogen on development of leaf-roll symptoms in the Irish potato. Abs. in *Amer. Potato J.* 25, 1948 (50-51).

Known leaf-roll plants and healthy controls were planted at 60, 70 and 80°F. (1) in wet or dry soils and (2) in soils with low or high N content. Leaf-roll plants at 80° in the wet series showed the first rolling only after 6 weeks, and in the dry series were indistinguishable from healthy plants. At 80° in the high-N series no definite rolling appeared, but the plants were more erect, with stiff, straight petioles—a characteristic which might aid in distinguishing leaf roll

at high temperatures—and their yields were less than half of those of healthy plants. Leaf-roll plants of all other series showed obvious leaf-roll symptoms.

[974] 633.491-2.8-1.81
COÏC, Y. Action de la fumure minérale sur les maladies de dégénérescence de la pomme de terre. [The action of mineral fertilizers on the virus diseases of the potato.] *C.R. Acad. Agric.* 29, 1943 (183-184). Hort. Abs. 17 (274).

Experiments in 1941 and 1942, using a 9-9-18 fertilizer, showed no manurial effect on the transmission or symptoms of leaf roll, but an improvement in the yields of both healthy and diseased stands.

633.5 FIBRE PLANTS

(See also Abs. No. 1059)

[975] 633.51-1.58
DUCKER, H. C.; HOYLE, S. T. Some studies on cultivation practices, food crops and the maintenance of fertility at the Cotton Station, Nyasaland. *E. Afric. Agric. J.* 13, 1947 (107-113).

Fairly acid reddish-brown soils occur on slopes with good natural drainage, and a black soil with Ca accumulation as nodular concretions occurs on the level where drainage is poor. The general mechanical composition of the two soils is similar, the black coloration being due to some peculiar difference in the state of the Fe compounds. In experiments comparing ridge and flat cultivation and 3 levels of digging, the rotation was cotton, groundnuts, cotton, maize. Cotton grown on ridged plots gave greater yield and average weight and higher moisture content. N was not leached away so quickly from a ridge as from the level.

Maize was the only crop that showed a positive response to digging with a native-type hoe to 4 inches depth. Digging before planting is not necessary except for the first crop after a resting period. For all subsequent crops an adequate seed bed is provided by making up the ridges.

[976] 633.51-1.81
STATEN, G.; HINKLE, D. A. Maintaining cotton yields through fertilizer and crop rotation. *New Mex. Agric. Expt. Sta. Bull.* 340, 1947, pp. 15.

Weighted averages for all tests on various soil types showed an increase in yield of

0.396 lb. of lint cotton per lb. of available P applied alone, 0.694 lb. of lint cotton per lb. of available N applied alone, 1.134 lb. of lint cotton per lb. of combined available N and P and 27.6 lb. of lint cotton for each ton of manure applied. Fertilizer is only profitable for maintaining or increasing yields where cotton prices are high and fertilizers comparatively cheap. General recommendations are about 40 lb. of available P combined with 60 to 100 lb. of available N per acre, except on heavy land which has recently been heavily phosphated. On such land phosphate may be reduced or eliminated.

[977] 633.52-1.5
BURMANN, F. W. Linseed. *Agriculture* 54, 1948 (535-538).

A table shows the methods used for the linseed crop in three different fields, the seed variety, rate and time of sowing, cultivation, fertilizers, harvesting and yields for each field being given. The use of modern types of seed and modern methods of husbandry increased the yields of the following crops thus disproving the objection that linseed robs the soil. Although sown in a field infested with wireworm the linseed was not at all affected.

[978] 633.52-2.4
EGLITIS, M. Beitrag zur Mikroflora der Leinpflanzen von leinmüdem Boden. [Microflora of flax plants on flax-sick soils.] *Contr. Baltic Univ. Pinneberg* No. 12, 1947, pp. 14. [G.e.]

The principal fungi attacking flax roots were (1) *Thielavia basicola*, (2) *Fusarium spp.* and (3) *Colletotrichum lini*. The roots were also attacked by (4) *Polyspora lini* and (5) *Stachybotrys alternans*. The fungi (2), (3) and (4) were also found on the flax plant above ground together with *Alternaria tenuis* and *Cladosporium herbarum*.

[979] 633.52-2.954 : 577-17
BLACKMAN, G. E.; HOLLY, K. Weed control in linseed and flax. *Agriculture* 54, 1948 (538-542). [Dept. Agric., Univ. Oxford]

Neither the NH_3 salt of DNOC nor a DNOC suspension should be used on either linseed or flax, but the Na salt may be used so long as it is not activated with $(\text{NH}_4)_2\text{SO}_4$ and no wetting agent is added. On linseed plants 3-12 inches high, the Na salt of

MCPA may be used without risk up to a concentration of 0.2% of the pure compound, or 2 lb./acre. The concentration of DCPA (2,4-D) must not exceed 0.1%. Ester-oil emulsions may kill the whole crop. Because of its effect on the fibre, MCPA should be used on flax at concentrations of less than 0.075% and should be applied when the plants are 4-10 inches high. DCPA is risky on flax. The Na salt of DNOC not exceeding 0.6% concentration, but no other DNOC compound, may be used on flax when plants are 4-10 inches high. Where linseed is used as a cover crop CuCl not exceeding a concentration of 1% is suitable.

A list of weed species is tabulated with recommendations for the type of weedkiller in lb./100 gallons/acre for linseed and flax.

[980] 633.523-1.841/2
CHOUDHURY, J. K. **Manurial experiments on jute. II. Effects of ammonium and nitrate nitrogen on the yield and growth of the plant *Corchorus capularis*.** *Trans. Bose Res. Inst.* 16, 1944-1946 (87-94). C.A. 42 (708).

Plants receiving cowdung at	5	10	15 seers
Mean yield/100 plants ...	1.02	1.10	0.96 lb.
Height of 10 plants at 13 weeks ...	839.3	—	968.7 in.
Mean dry weight of leaves ...	0.098	0.152	0.143 gm.
Mean area of leaves ...	39.67	56.55	49.51 sq. cm.
Plants receiving (NH ₄) ₂ SO ₄ at	1 lb.	2 lb.	3 lb./plot
Mean yield/100 plants ...	1.35	1.86	2.33 lb.
Height of 10 plants at 13 weeks ...	972	—	1057.3 in.
Plants receiving NaNO ₃ at	1 lb.	2 lb.	3 lb./plot
Mean yield/100 plants ...	1.40	1.48	2.03 lb.
Height of 10 plants at 13 weeks ...	893	—	1220.7 in.
Mean dry weight of leaves ...	0.126	0.245	0.214 gm.
Mean area of leaves ...	44.77	83.45	77.06 sq. cm.

[981] 633.524.3-2.4-1.416
THUNG, T. H. Grondonderzoek op *Phytophthora sabdariffae*. [Soil investigation on *Phytophthora sabdariffae*.] *Tijdschr. Plziekt*, 53, 1947 (86-90. [Inst. Plantenziekten, Buitenzorg, Java] [Du.e]

A method is described for testing the presence of *Phytophthora sabdariffae* in soil in which the fibre plant *Hibiscus sabdariffae* is to be planted. A paste of soil is spread on the leaves of *Ricinus communis* for 24 hours or a suspension of the soil is steamed over *Ricinus* leaves. The number of spots caused by *Phytophthora* is a measure of infection of the soil.

633.6 SUGAR CROPS

(See also Abs. Nos. 843, 932)

[982] 633.61-1.84 : 581.192
LAKSHMIKANTAM, M.; SANKARAM, A. **Influence of graded doses of nitrogen on the quality of cane juice and jaggery recovery.** *Curr. Sci.* 17, 1948 (90-91). [Sugarcane Res. Sta., Anakapalli]

N was applied as groundnut cake in increasing doses from 50 to 250 lb./acre, alone and with a basal dressing of 10 tons/acre of farmyard manure. Increase of N resulted in a progressive decrease in brix, jaggery, sucrose, purity and quality of juice and an increase in glucose. Sucrose and purity were decreased on plots receiving farmyard manure. 100 lb. of N as groundnut cake is the optimum from the point of view of both yield and cost of production.

[983] 633.61-1.879.2
PILLAI, S. C.; RAJAGOPALAN, R.; SUBRAHMANYAN, V. **Utilization of sewage farms for growing sugar-cane and production of white sugar.** *Curr. Sci.* 16, 1947 (342-343). [Indian Inst. Sci., Bangalore]

In India, sewage forms a fairly rich source of P and N, of which the sugar-cane crop requires a minimum of 100 lb./acre yearly. Trials have shown that the crop responds well to sewage irrigation, yielding from 40 to 80 tons per acre of good quality cane.

[984] 633.63-1.5
DECoux, L.; SIMON, M.; WAUTHY, R., ET AL. Quelques particularités de la culture de la betterave. [Some considerations special to sugar-beet culture.] *Inst. Belge Amélior. Better. Pub.* 16, 1948, pp. 23. [F.]

A rapid shallow preparation in any short period of favourable weather in March or

early April, with sowing on the same day or the next day at latest, has been proved on silt and sandy silt soils to be more economical and productive than the usual method, especially in dry years or when spring is late. Farmyard manure is applied either before sowing a preceding green-manure crop or in autumn, being ploughed in with P and K. N is applied in March, and the ground is tilled to about 5 cm. with a light gang plough or disc scarifier, immediately rolled or harrowed once or twice according to its condition, and sown immediately with 30-40 kg. of treated seed per ha. The rows are compacted without rolling the whole surface.

[985] 633.63-1.51
DECOUX, L. Préparation rapide du sol pour la culture des betteraves à sucre. [**Rapid soil preparation in the cultivation of sugar beet.**] *Mach. Agric.* No. 74, 1948 (10-11). [F.]

In order to achieve early sowing the rapid and superficial soil preparation practised in the sandy-loam areas of Belgium is advocated. Manure, K and P are applied in autumn. In March the land is ploughed and levelled and then lightly ploughed or disced to a depth of 5 cm. in a direction at right angles to that previously followed. N is applied to the soil which is then harrowed twice, rolled, harrowed again and sown with 30-40 kg./ha. of seed at a depth of 1 cm. and rolled. All the spring operations are carried through in one day. The shallow cultivation concentrates the solar heat in the upper 5 cm. of the soil, thereby accelerating germination, and prevents the downward movement of the finer soil aggregates formed by frost action and their replacement by moist clods. The rapid working reduces evaporation losses. The shape of the roots is unaffected by and increased yields have resulted from this superficial, rapid practice.

[986] 633.63-1.516
BILIAN, Z. Influence des travaux manuels sur le rendement de la betterave. [**Effect of hand operations on the yield of beet.**] *C.R. Assemb. Inst. Inter. Rec. Better. Bruxelles* 1947, Comm. No. 11, pp. 11. [F.]

Experiments were conducted to determine the effect of omitting the first and second hoeing and thinning in the cultivation of sugar beet in Bohemia. Omission of these

operations resulted in a decrease in root yields of 1.89, 4.54 and 26.19%, in leaf yields of 1.68, 4.25 and 2.03% and in profits of 60.80, 207.40 and 1,679.70 Kr./ha. respectively.

[987] 633.63-1.811.5
SIMON, M. Le rôle du sodium chez la betterave sucrière. [**The function of sodium in sugar beet.**] *C.R. Assemb. Inst. Inter. Rec. Better. Bruxelles* 1947, Comm. No. 14, pp. 10. [F.]

Research on the effect of Na on sugar beet is reviewed. It is concluded that the effect is favourable, particularly in light soils, but Na should be substituted by K in heavy clay or polder soils where Na reduces permeability.

[988] 633.63-1.841.1-1.531
ELLERTON, S. An experiment to show the effect of nitrogenous fertilizer and of 'topping' the stem on the yield and quality of sugar-beet seed. *C.R. Assemb. Inst. Inter. Rec. Better. Bruxelles* 1947, Comm. No. 13, pp. 4. [E.]

(NH₄)₂SO₄ was applied to sugar beet in March at rates of 0, 2 and 4 cwt./acre with and without a further application of 2 cwt. in June. The plants were topped at heights of 9 or 24 inches. The single application of 2 and 4 cwt. of fertilizer increased yields by 16 and 25% respectively, but the later dressings had no significant effect on yield, germination or cluster size. The March applications resulted in an increased percentage of clusters germinated in 4 days, but did not affect cluster size or the percentage germinated in 10 days. Topping at 9 inches increased yields by 17% and at 24 inches by 2%. Application of N to plants topped at 9 inches accelerated flowering, and early flowering appeared to be related to vigour of germination.

[989] 633.63-2.2
HARTSUIJKER, K. The sugarbeet eelworm in the Netherlands. *C.R. Assemb. Inst. Inter. Rec. Better. Bruxelles* 1947, Comm. No. 29, pp. 4. [Inst. Rat. Suiker., Bergen-op-Zoom] [E.]

Dutch research on sugar-beet eelworms has been directed to problems of host plants, distinction from oat eelworm, plant traps and survival in flooded soils. Crucifers, *Phaseolus* and rhubarb were found to act as host plants, but their use as traps appeared to be of

theoretical rather than of practical importance. A high percentage of larvae had survived inundation with salt water for 16 months. A system of soil sampling was set up in which the degree of infection in each field was determined and the farmers advised accordingly on suitable crops. Observations indicate that the majority of the larvae emerge from the cysts during the first two years after a sugar-beet crop, that there is only a slight decrease in larvae content of the cysts in the 3rd-7th years and that some living larvae may be present after 8-10 years.

[990] 633.63-2.2
SIMON, M. Développement actuel et perspectives des mesures de lutte contre le nématode de la betterave. [**Present and future developments in the control of beet nematodes.**] *C.R. Assemb. Inst. Inter. Rec. Better. Bruxelles* 1947, Comm. No. 30, pp. 14. [F.]

A review is presented on the control of sugar-beet eelworms, with reference to the evolution of resistant varieties and the use of chemicals, including volatile fumigants. It is concluded that the only satisfactory and economical method is the maintenance of a sufficiently long interval between host plants in the rotation, combined with strict control of weeds. On infested lands sugar-beet yields could be increased by cultural measures such as early sowing, the use of leafy varieties, the maintenance of high planting densities, the use of high fertilizing rates and increasing the humus reserves of the soil. Future lines of research are indicated.

[991] 633.63-2.2-2.953
JONES, D. P. Calcium chloroacetate as a soil dressing against beet eelworm, *Heterodera schachtii* Schmidt, with certain additional observations. *Ann. Appl. Biol.* 34, 1947 (240-245). [Sch. Agric., Cambridge]

Applications of 3 and 6 cwt./acre of calcium chloroacetate produced significant increases in yields of sugar beet grown on fen soil of the "skirt" type infested with beet eelworm, but the material had no effect on the eelworm content of the soil. The beneficial effect may be due to delayed emergence of larvae from cysts or to a direct response to the chloroacetate.

[992] 633.63-2.4-1.81
MORRIS, H. E. ; AFANASIEV, M. M. **Growing sugar beets following alfalfa in Montana.** *Proc. Amer. Soc. Sug. Beet Tech.* 1946, 1947 (389-393). R.A.M. 27 (3).

Land that had produced poor sugar beet because of root rot was seeded to lucerne for 2 years and divided into 4 plots. On 2 plots lucerne stubble was shallow-ploughed after the second crop, on one of the plots 50 lb. of treble super. + 1 ton of manure were applied, and both plots were ploughed and irrigated. On the other 2 plots the stubble was ploughed in after the third lucerne crop, the same fertilizer was applied to one of them and both were deep ploughed. The following spring the same cultural operations were repeated and the 4 plots were planted with beets. Ploughing after the second crop of lucerne followed by the application of fertilizers produced the least diseased beets. Autumn ploughing of lucerne land is not recommended unless manure, N and P are added to the soil.

[993] 633.63-2.765
JONES, D. PRICE ; JONES, F. G. W. **Wireworms and the sugar-beet crop: field trials and observations.** *Ann. Appl. Biol.* 34, 1947 (562-574). [Univ. Cambridge]

Evidence is provided that the extent of wireworm feeding on beet crops is partly dependent on the amount of alternative food, such as ploughed-in turf, interdrilled wheat and weeds. The protective effect of interdrilled wheat was confirmed in trial plots and in field-scale trials where high rates of seeding also increased the plant population.

633-7 STIMULANTS

(See also Abs. Nos. 1055, 1056, 1070)

[994] 633.71-1.81
RICHARD, J. **Cigar tobacco fertilization.** *Lighter* 17, No. 4, 1947 (9-16). [Dominion Expt. Sta., L'Assomption, Quebec]

Manure alone was uneconomic, but 10-12 tons/acre of manure + 1000 lb. of NPK can replace more expensive fertilizers like cotton-seed meal. Of the N fertilizers, $\text{NaNO}_3 + (\text{NH}_4)_2\text{SO}_4$ and $\text{KNO}_3 + (\text{NH}_4)_2\text{SO}_4$ gave the highest yields. Calurea gave the best quality and $\text{KNO}_3 + (\text{NH}_4)_2\text{SO}_4$ the best fire-holding

capacity. $\text{Ca}(\text{NO}_3)_2$ lessened the fire-holding capacity. Cottonseed, tobacco stalks, hops and yeast may be used to supply not more than 50% of the total N; yield can be increased by using larger amounts of organic N materials, but the quality is lessened. There is no advantage in using more than 20% of the total N in nitrate form.

Increasing applications of P increased the yield, but the quality was impaired when more than 60 lb. of P_2O_5 was used. Burning qualities decreased as the quantity of P was increased. Quality and fire-holding capacity increased with increased K. K_2SO_4 improved yield and quality, but impaired burning qualities. K_2CO_3 and KNO_3 produced the best burning leaf. Highest yield and best quality resulted with 10% of muriate, but the burning quality was impaired.

With an application of 1000 lb./acre of fertilizer, results were best with 5% N and 8% P_2O_5 ; using 500 lb./acre, 7% N and 10% P_2O_5 were required. N acted independently of the percentages of P and K, but high percentages of P and K should be given together. Drilling fertilizers in bands gave better yields and quality than broadcasting. The addition of 8% of MgO improved yield and quality. 50 and 100 lb./acre of sulphur had no effect on yield or quality.

[995] 633.71-1.828:546.56
GILBERT, F. A. **Copper as a fertilizer amendment for tobacco and other crops.** *Better Crops* 32, 1948 (8-11, 44-46). [Battelle Mem. Inst., Columbus, Ohio]

So far as is known, actual Cu-deficiency symptoms in tobacco have never been obtained under field conditions although they have been produced in the greenhouse. In a series of tests conducted on over a hundred farms, however, the addition of from 20 to 50 pounds of CuSO_4 per acre was found to increase the weight of tobacco in sixty-three out of eighty-nine cases and increased the quality in nine of the remainder. Increases were also obtained with cotton, potatoes and soybeans.

[996] 633.72-1.5
KRATCHENKO, B. **Le thé en U.R.S.S. [Tea in the U.S.S.R.]** *Agron. Trop.* 2, 1947 (614-646). [F.]

The ecology of the tea-growing areas is said to be comparable with that of Kanaya in Japan and of Han-K'eu in China. Tea is grown mainly on red soils, but also on yellow soils and on podzols. The red soils have an agrological value comparable to that of the best basalt red soils of Indo-China. The yellow soils are somewhat like certain rhyolite soils of the Haut-Donnai (Indo-China). The podzols and semi-marshy alluvial soils are not particularly suitable for tea. The tea soils of the U.S.S.R. suffer from one defect—they all have a compacted sub-soil, which makes drainage and amelioration difficult. Deep cultivation and sub-soiling are essential even for ordinary maintenance cultivation. Most of the tea is grown on slopes, and this, together with the clay sub-soil, makes it necessary to cultivate to depths of up to 40-50 cm. All cultivation is mechanized. Green manures are grown, such as lupins, *Vigna sinensis*, *Cajanus indicus* or *Schizolobium Deeringlatum*. Pruning methods are described. Planned manuring was only started in 1932 when Soviet industry first began to deliver fertilizers in sufficient quantities. The first fertilizers used were N, followed by P and K. $(\text{NH}_4)_2\text{SO}_4$ produced overall better results than other N fertilizers, but on some extremely acid red soils calcium cyanamide was more effective, particularly when combined with basic slag. N and P applied together were most effective. A double amount of P applied every two years, was more effective than two single annual amounts. The use of large amounts of N up to 222 kg. of N per hectare tends to render the soil too acid even for tea. A search is being made for minor elements which would counteract the harmful effect of lime on tea. B had no beneficial effect.

[997] 633.73-1.816.3
GUISCAFRÉ-ARRILLAGA, J. **Relación entre el sistema de raíces del cafeto y el método para aplicar abonos. [The relation between the root system of coffee and the method of applying manures.]** *Rev. Agric. P.R.* 37, 1946 (141-144). Hort. Abs. 17 (304).

Fertilizers should be applied in a shallow circular trench just beyond the spread of the tree's branches.

[998] 633.73-2.19
COFFEE SERVICES OFFICERS, KENYA.
Yellowing symptoms of coffee. *Coffee*
Bd. Kenya, Mo. Bull. 12, 1947 (82). Hort.
Abs. 17 (304).

Yellowing may be caused by exposure,
excessive crop or nitrate deficiency.

633.8 AROMATIC, MEDICINAL AND OIL PLANTS

[999] 633.822-1.5
POWERS, W. L. **The management of
mint soils.** *Better Crops* 31, 1947 (15-20, 46).

Peat and muck soils or recent alluvial
lands of fine sandy-loam to silt-loam texture
are suitable for mint. Suitable reactions are
pH 4.8-7.3. Irrigation is desirable unless
mint is grown on sub-irrigated peat land.
Sprinklers are used to apply 2-3 inches'
depth of irrigation each 10 to 15 days,
beginning about June 1. With surface
irrigation as much as 24 inches depth is used
each season. Supplemental fertilizer of a
soluble material is applied through sprinklers.
Heavy NO_3 application in season and heavy
irrigation tend to increase stem growth and
decrease menthol. Phosphate tends to
promote blooming and early maturity.
K tends to prevent lodging and shattering
and overcomes leaf scorch, premature defolia-
tion and loss of oil. Borax has increased
yield of hay and improved menthol condition
of the oil. K increased yield and quality
of oil on peat and muck.

[1000] 633.85
HANSEN, P. L.; MIGHELL, R. L. **Oil crops
in American farming.** *U.S.D.A. Tech.*
Bull. 940, 1947, pp. 55.

The world situation is reviewed under
such headings as the world's major oil crops,
trends in world production and trade,
outlook for 1955 and world-consumption
pattern. Thirteen oil crops accounted for
approximately 90% of all the vegetable-oil
crops produced in the world during the
5-year period 1934-38: coconuts, peanuts,
flaxseed, palm, soybeans, palm kernel, cotton-
seed, olive, tung, sesame, rapeseed and
mustard seed, sunflower, babassu.

[1001] 633.854.56-1.842.4
LOUSTALOT, A. J.; LAGASSE, F. S. **Com-
parison of winter and early spring**

applications of nitrogen to tung trees.
Proc. Amer. Soc. Hort. Sci. 48, 1946 (51-58).

In Florida, NH_4NO_3 applied to tung trees
in December or January was absorbed and
transported to the growing points; these
trees contained in the young shoots and
fruits more N than trees fertilized in
February or March. The early-fertilized
trees made better growth to late June
although the N contents of leaves, shoots
and fruits of the two sets of trees were the
same at this date. There was no evidence
that early fertilization caused the trees to
bloom earlier than unfertilized trees.

[1002] 633.885.1-1.432.2
WINTERS, H. F. **Growth and survival of
cinchona seedlings.** *P.R. Fed. Expt. Sta.*
Rept. 1946, 1947 (14-15).

Survival of cinchona seedlings grown
locally in soil was better than that of
imported seedlings grown in sphagnum.
Removal of sphagnum from imported seed-
lings by washing did not affect significantly
either the incidence of disease or the height
of the plants. Survival was best in plots
of medium soil moisture, next best with
high soil moisture and lowest in lightly
watered plots. The incidence of disease was
lowest in medium-watered treatments.

[1003] 633.885.1-2
LOMBARD, F. F. **Review of literature on
cinchona diseases, injuries, and fungi.**
U.S.D.A. Bibl. Bull. 9, 1947, pp. 70. [Div.
Forest Path., U.S. Bur. Pl. Indust.]

633.9 RUBBER PLANTS

[1004] 633.912-1.816.3
RUBBER RESEARCH INSTITUTE OF MALAYA.
Methods of application of fertilizers.
Rubber Res. Inst. Malaya Circ. 27, 1947, pp. 6.

For tree crops, complete fertilizer should
be placed 6 inches deep in furrows between
rows or 6 inches deep in a series of holes
around the tree. P and K fertilizers are used
much more effectively in this way, but,
provided there is no risk of surface wash,
N fertilizers may be broadcast on the surface.

[1005] 633.913.31-2.4-1.432.2-1.436
SCHNEIDER, H. **Susceptibility of guayule
to verticillium wilt and influence of**

soil temperature and moisture on development of infection. *J. Agric. Res.* 76, 1948 (129-143). [Bur. Pl. Indust. U.S.D.A.]

Experiments in constant-temperature tanks indicated that *Verticillium albo-atrum* becomes inactive at soil temperatures of 80-85°F. Irrigation experiments showed that the fungus is active in soil at all moisture levels above the wilting point. Maintaining the top 6 inches of soil at the wilting point prevents infection.

634 ORCHARDS. FRUIT

(See also Abs. Nos. 748, 906)

[1006] 634-1.347.24
WILCOX, J. C. **Establishing an undertree sprinkler schedule for orchards.** *Proc. Wash. St. Hort. Assoc.* 1946, 1947 (241-244).

The recommendations are for British Columbia conditions where sprinkler-irrigation experimental work has lagged behind growers' experience.

[1007] 634-1.347.24
OVERLEY, F. L. **Sprinkler irrigation in orchards.** *Proc. Wash. St. Hort. Assoc.* 1946, 1947 (227-232). [Tree Fruit Br. Wash. Agric. Expt. Sta. Wenatchee]

The results of sprinkler-irrigation experiments over 15 years are discussed under the following headings: intervals between irrigations, amount to apply at each irrigation, types of sprinkler, overhead and undertree sprinkling, effect on plant food and fertilizers, establishment and growth of cover crop, sprinkler and rill irrigation and effect of irrigation water on tree-root development.

[1008] 634-1.347.24
HING, W.; BENSON, N. **Experimental studies on sprinkler irrigation in orchards.** *Proc. Wash. St. Hort. Assoc.* 1946, 1947 (239-240). [Pullman. Wenatchee]

With sprinkler irrigation it is possible to apply water to light sandy soils uniformly and without erosion.

[1009] 634-1.347.24
CLAWSON, O. T. **Twenty years of orchard sprinkling.** *Proc. Wash. St. Hort. Assoc.* 1946, 1947 (235-238).

In addition to the irrigational benefits of sprinkling, high sprinkling removes obnoxious dust from the trees and fruits, controls spot mites and aids greatly in the development of colour in fruit.

[1010] 634-1.584
OVERLEY, F. L.; BENSON, N. **Recent developments in orchard cover crop management.** *Proc. Wash. St. Hort. Assoc.* 1946, 1947 (157-159).

Lucerne is the best cover crop for orchards, but in old orchards with As-toxic soil re-establishing and maintaining legumes is difficult. Annual grasses are the best substitute for lucerne, rye grass being the best so far tested. Perennial grasses are easily established, but sometimes difficult to eradicate. Orchard grass is the best, but is objectionable to the sprayer because of its bunchy habit. A 16-20 PK fertilizer is excellent for cover-crop growth. One-half of the N should be applied with the 16-20 and the rest broadcast as $(\text{NH}_4)_2\text{SO}_4$ or NH_4NO_3 round the tree, well outside the range of its branches.

[1011] 634-1.811.9-1.51
BATJER, L. P. **Minor elements in orchard fertilization.** *Proc. Wash. St. Hort. Assoc.* 1946, 1947 (179-183).

In Washington orchards B, Zn and Fe deficiencies occur. The available forms of these elements are usually found in the surface soil, and cultural practices that encourage surface feeding by roots are generally helpful. These practices include shallow and infrequent tillage and sprinkler irrigation coupled with very shallow or no cultivation.

[1012] 634.11-1.84 : 581.192
BENSON, N.; OVERLEY, F. L. **The influence of fertilizers on the storage of apples.** *Proc. Wash. St. Hort. Assoc.* 1946, 1947 (184-186).

Excessive applications of N favour the production of large-sized apples of poor keeping quality. The application of P and K does not alter this tendency, which is corrected only by reducing the N dressings and by growing non-legume cover crops.

[1013] 634.11-2.4
COOLEY, J. S. **Natural infection of replanted apple trees by white root rot fungus.** *Phytopath.* 38, 1948 (110-113). [Bur. Pl. Indust., Beltsville, Md.]

More than half the replants in infested soils became infected with white root rot. The presence in the soil of woody material is necessary for the start and maintenance of the pathogen.

[1014] 634.22-1.544.7-1.67
KRUGER, T. L. **Studies on soil moisture and irrigation practices.** *Farm. S. Africa* 22, 1947 (1146-1147). [Gov. Guano Islands]

With straw mulch 2-3 inches thick, in a prune orchard, irrigation water penetrated to a depth of 30 inches, whereas on bare plots double the quantity of water penetrated to only 18 inches. Trees in the mulched plots retained their leaves longer and produced larger fruits of a higher quality than trees in bare plots. Soil temperature under mulch was 60-65°F. and in unmulched plots it rose to 130°. 6 inches below the mulch the volume-weight of the soil after irrigation was 1.5 as against 1.7 in the unmulched plots where it was inclined to pan down.

[1015] 634.3-2-1.432.3
JAMISON, V. C. **Resistance to wetting in the surface of sandy soils under citrus trees in central Florida and its effect upon penetration and the efficiency of irrigation.** *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (103-109).

The spreading decline of old citrus groves is related to a resistance to water penetration that arises in the surface 8 inches of the dry bodies of soil immediately below the branches. The resistance is a property of the organic matter and is not due to waxes or oils but appears to be a colloidal surface phenomenon. Several 3-inch-deep spool-disc cultivations to within 2 feet of the trunks before the summer rains, or alternate cultivation and irrigation are recommended. Branches more than 2 feet above ground level should not be pruned off. Laboratory tests show that mixing wettable alumino-silicate or phosphatic clays into the top inch before cultivation should improve wetting.

[1016] 634.3-2.4-1.4
RHOADS, A. S. **Clitocybe root rot of citrus trees in Florida.** *Phytopath.* 38, 1948 (44-61). [Res. Lab., Duxbury, Mass.]

Mushroom root rot of woody plants caused by *Clitocybe tabescens* occurs most frequently on light, well drained, acid sandy soils, but it also occurs on alkaline soils. In orchards the soil type seems to have little influence on the incidence of the disease, which is most prevalent in areas where oak and other hardwoods occurred before clearing.

[1017] 634.51-1.5
GLENN, E. M. **Growing walnuts in England.** *E. Malling Res. Sta. Rept.* 1946, 1947 (160-164).

The walnut tolerates a wide range of soils so long as drainage is good and the soil not too acid. Lime should be applied before planting. The ground for 3-4 feet around each tree should be cultivated for the first few years. The best form of manuring is a mulch of farmyard manure or compost spread around the tree in spring and dug in in autumn or winter. Artificial-N manures should not be applied in large amounts as they encourage soft growth.

Descriptions are given of the propagation of the walnut, with notes on varieties and diseases.

[1018] 634.58-1.81: 581.192
BRADY, N. C. ; REED, J. F. ; COLWELL, W. E. **The effect of certain mineral elements on peanut fruit filling.** *J. Amer. Soc. Agron.* 40, 1948 (155-167). [N.C. Agric. Expt. Sta., Raleigh]

In a sandy soil of pH 5.8 that was known to produce good vine growth but poor-quality fruit, Ca consistently increased fruit filling when supplied to the fruiting zone. Mg slightly increased fruit filling, but the addition of K to the rooting or fruiting zone slightly depressed filling except when 20 p.p.m. of Ca was added as CaSO₄ to the fruiting zone. Cl, SO₄ or PO₄ added to the fruiting zone did not affect filling. CaSO₄ increased the Ca and K content of stems but decreased the N content.

[1019] 634.58-1.81-1.821.1
GEORGIA AGRICULTURAL EXPERIMENT STATION. **Fertilizers and amendments for peanuts.** *Ga. Agric. Expt. Sta. Rept.* 1946-47, 1947 (23-25).

5000 lb./acre of calcic limestone, broadcast over peanut plots in an effort to control an infestation of *Sclerotium rolfsii*, increased the yield of peanuts, but had no effect on the disease. Without limestone, P and K had little effect on yield, but with limestone the yield from P+K was better than that from a complete fertilizer without limestone. N+K produced a higher yield than NPK.

[1020] 634.58-1.821.1-1.416.7
ROGERS, H. T. **Liming for peanuts in relation to exchangeable soil calcium**

and effect on yield, quality and uptake of calcium and potassium. *J. Amer. Soc. Agron.* 40, 1948 (15-31).

In Norfolk sands and sandy loams of pH 5.1-6.0 with exchangeable-Ca content (expressed as CaCO_3 equivalent) varying from 160 to 1241 lb./acre, soils with (a) more than 700 and (b) less than 600 lb./acre showed (a) slight and (b) very significant increases in groundnut yield on liming. Of 10 Ca sources tested all except 2 Ca-silicate slags (blast-furnace and phosphate-reduction-furnace slag) were of about equal value. The beneficial effects of liming were due to the supply of Ca and Mg as nutrients. K_2O at 120 lb./acre decreased the shelling percentage of sound mature kernels by 4%, but 30-60 lb./acre had no harmful effect. Liming a Ca-depleted soil reduced the K content of vines by 30-46%, partly because of increased growth and efficiency of K utilization. Groundnuts tolerate a high Ca:K ratio and are capable of luxury absorption of K far in excess of growth needs.

[1021] 634.58-1.84-1.461.52
THORNTON, G. D.; BROADBENT, F. E. Preliminary greenhouse studies of the influence of nitrogen fertilization of peanuts on nodulation, yield and gynophore absorption of this element. *J. Amer. Soc. Agron.* 40, 1948 (64-69).

Inoculated peanuts were grown in N-deficient soil in pots in which the rooting and fruiting zones could be kept separate. N applied as $\text{Ca}(\text{NO}_3)_2$ at planting greatly reduced nodulation and increased the N content of the plants. 6 and 12 p.p.m. of N either at planting or 5 weeks later slightly increased the percentage of mature nuts at harvest, whereas 66 p.p.m. spread over 11 weeks reduced the percentage and retarded maturity.

The absorption of N by peanut gynophores, as shown by the use of isotopic N, is considerable when the N content of the rooting medium is near starvation level, and is negligible when ample N is present in the rooting zone, either from inoculation or a combined-N source.

[1022] 634.63-1.81
CARRANTE, V. Un quadriennio di concimazione dell'olivo in clima arido (1943-1946).

[Four years of fertilizing olive trees in an arid climate (1943-1946).] *Ann. Spcr. Agrar.* (New Series) 1, 1947 (181-215). [I.e.]

1:3:3 fertilizer increased yield on unirrigated plantations.

[1023] 634.653-2.4
CRANDALL, B. S. *Phytophthora cinnamomi* root rot of avocados under tropical conditions. *Phytopath.* 38, 1948 (123-129). [Estac. Cent. Colon. Tingo Maria, Peru]

Only well drained sites on sandy or loose, friable soils are recommended for avocado trees.

[1024] 634.73-1.4
SCHWARTZE, C. D.; MYHRE, A. S. Rooting blueberry cuttings. *Wash. Agric. Expt. Sta. Bull.* 488, 1947, pp. 32.

In the climatic conditions of Puget Sound, softwood cuttings taken in early June and hardwood cuttings taken after February 22, if for rooting with bottom heat, or in March if for rooting without bottom heat, rooted satisfactorily when set vertically to $2\frac{1}{2}$ inches (half their length) in a mixture of horticultural peat and fine sand (3:1 by volume) in sash-covered ground beds in lathhouses giving $\frac{1}{2}$ - $\frac{3}{4}$ shade. Bottom heat at 70°F greatly improved the rooting of hardwood but not of softwood cuttings. Plant-growth substances did not improve the rooting of either.

[1025] 634.774-2.4-1.81
ANDERSON, E. J. Laboratory studies of root-rot infection in pineapple in relation to nutrient concentration. Abs. in *Proc. Hawaii. Acad. Sci.* 22, 1947 (7). R.A.M. 27 (142).

Severe root and heart rot (*Phytophthora cinnamomi*) of pineapple is most prevalent in Hawaii in areas of high rainfall and during wet weather. In short-term pot cultures in naturally infested soil, the disease was substantially reduced by heavy applications of a complete fertilizer, and also by lighter treatments plus a heavy K_2SO_4 amendment.

[1026] 634.8-2.19:546.56
MICHEL, A. Sur un nouvel aspect du problème du court-noué de la vigne. [A new aspect of the problem of court-noué in the grape.] *C.R. Acad. Agric.* 34, 1947 (179-181). [F.] [Vine Res. Sta., Beaune]

In a continuing investigation, the results of analysis of a range of vineyard soils for Cu content at various depths indicate (1) that Cu applied to vineyards is not all held in the surface layer of the soil: large quantities pass into deeper layers, especially in light soils, and (2) that the presence of court-noué is closely related to the degree of migration of Cu from the surface layer and to the Cu content of the region of the soils in which the roots of the vine are developing.

634.9 FORESTRY

[1027] 634.9-1.452-1.435.5
VIRO, P. J. Metsämaan raekokoomus ja viljavuus varsinkin maan kivisyttä silmällä pitäen. [The mechanical composition and fertility of forest soil with special reference to the stoniness of the soil.] *Commun. Inst. Forest. Fenn.* 35, No. 2, 1947, pp. 115. [Fie.]

A study of the relationship between the fertility of morainic, gravel and sandy forest soils of south Finland and their degree of stoniness (expressed as volume percentage of blocks and stones in the soil). In morainic soils only, the depth index—the average penetration of a steel rod of 1 cm. in diameter—was closely correlated with stoniness as measured by mechanical analysis. Soils were divided into classes I, II and III of stoniness (<30% of stones, 30-60% and > 60%). The moisture equivalent at various depths in the soils, the volume and other data of tree growth and the density of the undergrowth were recorded. In morainic soil, stoniness was the most important factor affecting fertility, through the diluting effect of stones on the content of finer particles from which plants obtain most food. The yield capacities of the 3 classes of soil were approximately in the ratio I : II : III :: 100 : 75 : 50. Correlation between the fine-particle content (<2 mm.) and soil fertility was very close provided the fine fraction was expressed as a percentage of the whole soil including blocks and stones. In morainic soils water was not a limiting factor. With gravels and sands, water content was the main factor in fertility and appeared to depend chiefly on the stratification and grain size of the deeper soil layers.

[1028] 634.952-1.589
GRIFFITH, A. L. The effects of burning on the soil as a preliminary to artificial regeneration. *Indian For. Bull.* 130, 1943, 1946, pp. 34. For. Abs. 9 (304).

Results of experiments on an exhausted agricultural loamy soil indicated that removal of ash from a burnt area decreases the moisture equivalent of the soil. Burning resulted in an increase in nitrate N, pH value of the top soil and in height growth. The heat of the burn was not sufficient either to destroy the intimate humus or to break the clay complex even in the top 3 inches. The addition of ash to unburnt soil increased height growth, but not so much as did burning.

[1029] 634.956.4-1.875
WILDE, S. A.; BRENER, W. H.; KRUMM, C. J. Types of composted fertilizer used in forest nurseries. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (508-510). [Univ. Wisconsin, Madison]

Three types of compost used in nursery practices are distinguished—(1) fermented composts, prepared from organic matter which undergoes rapid decomposition and contains nutrients largely in biologically fixed form; (2) partly activated composts, made from a mixture of decomposable and resistant organic residues which retain mineral salts by both biological and physico-chemical absorption; (3) inert composts, chiefly peat, that act like sponges, absorbing nutrient salts in exchangeable form.

Black-locust seedlings grew better in soil treated with unsterilized hardwood-hemlock duff (compost-type 1) than in soil treated with sterilized duff. In another series of experiments, in which peat (compost-type 3) treated with varying quantities of mineral nutrients was used, growth of seedlings was closely related to the amount of nutrients added. Large plants were produced in pots with a high nutrient status, but their quality was poor. Seedlings produced on partly activated compost (2), prepared by mixing 25% of (1) with 75% of (3) had the most desirable characteristics, including adequate size, low top-root ratio, fibrous root systems with well developed nodules, and a healthy colour. It is concluded that partially activated composts are the most generally desirable from both the nutritional and economic standpoints.

[1030] 634.975-1.435.1
TAMM, C. O. Markförbättringsförsök på mager sand. Undersökningar på Mölna försöksfält nära Vageryd i Småland. [Soil-improving measures on poor sand. Investigations on Mölna experimental field near Vageryd in Småland.] *Medd. SkogsforskInst.* 36, No. 7, 1947, pp. 115. [Sw.e.]

The soil is a glacio-fluvial sand, poor in nutrients. Of all the treatments, manuring with peat from a birch carr was the most efficient. The mean height of peat-manured pines was 4.8 m. in 20 years as against the controls with a height of 4.1 m. The effect of a brush cover lasted only a limited time; that of the peat treatment appears to be more lasting. No effect was observed from removing the brush, liming or mixing humus with sand in the pots. Burning or any treatment likely to speed up decomposition of humus is dangerous on this sandy soil. If a canopy is not formed within a few years after felling, a degenerative development sets in, leading to a lichen-pine type of forest, with a low yield. A close correlation has been found between the occurrence of nitrate plants (*Chamaenerion angustifolium* and others) and the transformation of the humus layer. These plants do not indicate favourable conditions for young seedlings, as rapid decomposition may cause exhaustion of nutrients in a soil which is already low in them. Birch seedlings are apparently more sensitive to unfavourable influences than pine or spruce seedlings. They appear to be more sensitive than young pines to competition from older deciduous trees. Pine seedlings apparently do not suffer much from root competition by birches.

[1031] 634.975-1.466.1
DOMINIK, T. Znaczenie mikroflory glebowej dla rozwoju sadzonek sosnowych. [The rôle of soil microflora in the rate of growth of Scots-pine seedlings.] *Przegląd Leśniczy, Poznań* 1946, July (7-12). For. Abs. 9 (277). [Pl.]

Old arable land comprising a heavily manured and limed sand on clay and with pH 6.5 to 7.5 was planted with one-year-old Scots-pine seedlings. Soil from the A₁ horizon of a neighbouring pine stand was incorporated with the original soil or put in the planting holes only, in order to inoculate the arable soil with the microflora

of a climax-forest association. The next spring, increased heights and lengths were shown by the seedlings on the inoculated plots compared with the untreated controls. The mycorrhizae of the latter showed greater morphological variety than those of the former, and it suggested that this is due to the activity of undesirable fungi which may have caused previous wholesale mortality of Scots pine on old arable soils. It is believed that inoculation protects the roots from such fungi.

[1032] 634.975: 634.952.2-1.81
HOLMBÄCK, B.; MALMSTROM, C. Några markförbättringsförsök på nordsvenska tallhedar. [Site-improvement experiments in lichen-pine forests in Northern Sweden.] *Medd. SkogsforskInst.* 36, No. 6, 1947, pp. 82. [Sw.e.]

The response of naturally regenerated pine seedlings to clear felling is always better where the stand was heavy and vigorous. This response is ascribed to the manurial effect produced by the decomposition of fresh material (young roots, mycorrhizae, etc.) rich in N, and of waste from felling and logging operations.

These manurial effects from clear felling are temporary. Silviculturally the main problem of the lichen-pine forests is how to secure a good stand of young growth as quickly as possible after clear felling, while the manurial effects last. Irrigation has been shown to bring about a general stimulation of growth. The response to irrigation is apparently due to other factors than improved water supply. A striking correlation was found between the duration of the responses and the depth of cover of mud deposited by the irrigating water. Analysis has shown that the mud is rich in N and has a remarkably high content of mineral nutrients. The most important factor is believed to be the high content of N.

635 HORTICULTURE

[1033] 635-1.411.4
AHLSTRÖM, B.; TERASMÄE, E. Köksväxtodling på torvjord. Resultat av försök under åren 1939-1944 på kärr- och vitmosstorvjord vid Ageröd i Skåne. [Vegetable cultivation on peat soil. Results of experi-

ments during 1939-1944 on fen and sphagnum-peat soils at Ageröd in Skåne.] Svenska Vall- o. MosskFören. Kvartalsskr. 9, 1947 (247-265). [Sw.e.]

The fen soil had high, and the sphagnum-peat soil low, contents of ash, Ca and N. When adequately limed and fertilized good yields were obtained, especially on the fen soil, of cabbage, cauliflower, beet and peas. Carrots and leeks gave rather low yields possibly due to a high water table. Celeriac gave a good yield in one year out of three. Carrots, beet and celeriac tended to produce branched, deformed roots when grown on sphagnum-peat soil unless the soil was well managed and adequately limed and fertilized.

[1034] 635.25-1.84
HEATH, O. V. S.; HOLDSWORTH, M.; TINKER, M. A. H., ET AL. **Studies in the physiology of the onion plant. III. Further experiments on the effects of storage temperature and other factors on onions grown from sets.** *Ann. Appl. Biol.* 34, 1947 (473-502). [Imp. Coll. Sci., London, and Roy. Hort. Soc.]

The average effect on bolting, ripening and yield of onions of 302 and 604 lb./acre of $(\text{NH}_4)_2\text{SO}_4$ or of $2\frac{1}{2}$, $4\frac{2}{3}$ and 7 cwt./acre of NaNO_3 at two application times was not significant.

[1035] 635.31-1.81
DEPARDON, L.; BURON, P. La fumure de l'asperge. [Fertilizing asparagus.] *C.R. Acad. Agric.* 33, 1947 (713-716). [F.]

The most suitable soil is one which contains in the upper 30 or 50 cm. a sandy layer immediately above a layer well supplied with clay. N and K uptake are moderately high, but mineral P need be added only occasionally if 10,000 kg./ha. of manure are applied each year. 400-450 kg./ha. of nitrate of chalk (13%) + 100 kg./ha. of KCl should be applied as a single dressing shortly before the spring earthing-up.

[1036] 635.34-1.84 : 581.192
WANG, T. C. [The effects of natural and artificial nitrogenous fertilizers on the content of crude protein in cabbage.] *J. Agric. Assoc. China* No. 184, 1947 (75-78). [Ch.e.]

In field experiments there was no significant difference in the effects of the 2 types of N.

[1037] 635.35-2.191 : 546.77
WARING, E. J.; SHIRLOW, N. S.; WILSON, R. D. **Molybdenum in relation to whiptail of cauliflower.** *J. Aust. Inst. Agric. Sci.* 13, 1947 (187-188). [Dept. Agric., Sydney]

0, $\frac{1}{4}$, 1 and 4 lb./acre of sodium molybdate were applied to soil of pH 6.6-7, heavily fertilized with N, and 4 levels of soil acidity were provided by applying 500 lb./acre of S, nothing, 1 ton/acre of dolomite and 2 tons/acre of dolomite. Severe whiptail occurred only on plots treated with S and either no molybdate or $\frac{1}{4}$ lb./acre of molybdate. No trace of whiptail was found on plots to which dolomite or molybdate at the heaviest rate was applied or on plots receiving 1 lb./acre of molybdate and no S or dolomite. 1 lb./acre of molybdate prevented all except a trace of whiptail on land treated with S, but $\frac{1}{4}$ lb. of molybdate was inadequate. The availability of Mo decreased as soil acidity increased.

At the end of the experiment, soils which had received S were of pH 6.1, those which received no S or dolomite 6.8, those which received 1 ton/acre of dolomite 7.2 and those which had 2 tons of dolomite 7.7.

[1038] 635.64-1.816.3
EAVES, C. A.; CANNON, H. B. **Fertilizer placement and yield.** *Agric. Chem.* 3, No. 1, 1948 (49-50). [Canad. Dept. Agric.]

700 lb./acre of 2-12-6 fertilizer were applied to tomatoes, either partly or wholly (1) in the furrow, (2) drilled, (3) broadcast and disced, (4) broadcast and ploughed, (5) as bands. Two treatments received additional side dressings of N and K during the growing season. Highest yields with lowest incidence of blossom-end rot were obtained with (2) and (3) + additional side dressings. (5) gave poor results and with (4) the incidence of blossom-end rot was high.

[1039] 635.64-1.833.3
MARCHESI SOCIATS, J.-M. El abonado potasico en el cultivo del tomate. [Potassium fertilizer in tomato cultivation.] Madrid 1948, pp. 43. [Sp.]

A report on the K-fertilizing efficiency of polyhalite outcropping at Molledo (Santander). Yields of tomatoes receiving

basal P and N and (1) no K, (2) artificial KCl and (3) polyhalite, were in the ratio 100 : 117 : 167.

The keeping quality of fruits picked during the normal harvest (first 3 weeks of September) was about equal for plants receiving treatments (2) and (3), but with later pickings, until November, fruits from series (2) and (3) kept for 17 and 7 days respectively. The radioactivity of the Mollendo salts is high, with an optimum U content for photosynthesis.

GEOGRAPHICAL

(See also Abs. Nos. 770, 787, 821, 825, 836, 876, 910, 919, 975, 985, 989, 996, 1017)

[1040] (415)631.473
SIMINGTON, R. C.; WHEELER, T. S. Sir Robert Kane's lost soil maps. *Eire J. Dept. Agric.* 44, 1947 (10-14).

Reproduction, with an introduction by the authors, of an article entitled "Museum of Irish Industry" that appeared in the *Dublin University Magazine*, August, 1853. "The soil and subsoil being both taken, and observations made as to the character of vegetation, the crops, the underlying rock, etc.; all these specimens are forwarded to the Museum to Sir Robert Kane. The precise spots that the specimens are taken from are indicated on the townland map, and transferred to the county index, which thus gradually becomes covered with a net work of marks of soil specimen stations. The next step is their mechanical and chemical analysis. In this the gravels are first separated, and a preliminary classification made according to their quantity and nature. . . .

"After the separation of gravel, the true material of the soil remains, the nature of which is to be determined; and this is done, in the first instance, by the *classification analysis*, as it is termed—that is to say, the process to ascertain the class the soil belongs to. For this purpose . . . the quantity of clay, of sand, of lime, and of organic matter is determined. The relation between these determines the general character of the soil. Two great divisions of soils are recognised by Sir Robert Kane—the calcareous and non-calcareous. Of each of these classes the varieties of soil are—first, clay; second,

clay loam; third, loam; fourth, sandy; fifth, peaty: the extremes being, plastic clay, pure marl, and pure peat. . . Specimens are then subjected to the most complete and refined analysis which chemical science admits. The alkalies (potash and soda), the magnesia; the phosphoric acid, the nitrogen, the soluble silica, and all other matters of any possible agricultural or scientific interest are determined. . . Then comes the task of representing these results. For this purpose Sir Robert Kane has adopted the principle of indicating the nature of the soil by colours on a map. . . .

"By means of such investigations and such maps, the real nature and values of our soil and country are being represented for us with a scientific completeness and a practical usefulness beyond anything that has been attempted in any other country, even the most advanced. The geological maps. . . have little or no reference to the practical agricultural character of the soil, except in some very few and limited localities. . . For the fact is . . . that the underlying rock has very seldom any necessary connexion with the surface agricultural soil."

[1041] (415)631.473
SIMINGTON, R. C.; WHEELER, T. S. Sir Robert Kane's soil survey of Ireland: the record of a failure. *Studies* 1945 (539-551). *Eire J. Dept. Agric.* 44, 1947 (15-28).

An account of a project first described in 1848 for evaluating land and classifying soils on an "agronomical" or "agrological" basis. Land-valuation maps of all Irish counties were completed by 1853. The soil survey was never completed; several maps were prepared, but both these and the land-valuation maps have been lost. Five classes of land—waste lands, lands of inferior, medium and superior value, and lands of "factitious" value (above 32s. an acre)—were distinguished by different colours on the maps. Soils were distinguished according to their chemical and mechanical composition. A collection of soils and subsoils, amounting to over 1300 samples in 1852, was made at the Museum of Irish Industry, Dublin, of which Kane was Director. In 1854 Kane reported to the House of Commons that 751 soil analyses had been made, covering Dublin, Kildare, Wexford, Wicklow

and part of Carlow, Kilkenny and Leix, and that many of the analytical results had been embodied in half-inch maps. Thereafter the work seems to have flagged, owing to the excessive time consumed and the expenses incurred by officers of the Geological Survey in taking soil samples.

[1042] (417)634.9-1.4
McEVOY, T. **The forest vegetation of Irish native woodland.** *Irish Forestry* 3, 1946 (84-92). Biol. Abs. 21 (2038).

The natural climax types in Ireland are (1) oak woods of acid soils, and (2) woods of calcareous soils with 3 sub-divisions, oak-ash on deep soils, ash on shallow soil and hazel scrub on bare limestone. Besides these there are 2 minor types, alder and birch, which depend on the presence of a high water table.

[1043] (42)631.81
CROWTHER, E. M. **Fertilizers in the agricultural expansion programme.** *Agriculture* 54, 1948 (491-500). [Rothamsted]

The supply of N fertilizer is probably sufficient to meet the demands involved in the programme, but it may be necessary to import soluble P fertilizers or to use those forms requiring little processing, such as ground mineral phosphate which is highly effective on acid soils and in wet areas. It is important that fertilizers should be used more widely and efficiently and that grassland should receive more manure than during the war, but not at the expense of tillage crops. The principles involved in working out a manuring programme are demonstrated for potatoes, sugar beet and cereals where the values of crop increases can be calculated on the basis of experimental results. Generalizations, however, may need modification if combined drilling is used. The maintenance of the National Compound Fertilizers system is advocated, and a national programme attempted by combining likely acreage figures with suitable average rates of dressings for the main classes of crops. The serious need for more widespread liming by extension of special services for spreading is indicated.

[1044] (42)633.11-1.81
COWIE, G. A. **The fertilizer requirements of wheat as determined by field trials.** *Chem. Indust.* No. 14, 1948 (211-216).

Experiments on the mean responses of wheat to N, P and K on a wide range of soils indicate that N is the main requirement of wheat in England. The mean response to the second cwt./acre of $(\text{NH}_4)_2\text{SO}_4$ or equivalent N (2.2 cwt. of grain) almost equalled that to the first cwt. (2.4 cwt. grain). The data do not support the use of N in the autumn for autumn-sown wheat, and there was no clear advantage in dividing the N dressing. Late-spring applications and the use of shorter and stiff-strawed varieties reduced the risk of lodging from the use of more N.

P and K appear to be required as economic supplements only for definitely deficient soils. Placement in smaller quantities with the seed may increase the efficiency of P and K.

[1045] (44)631.4
MONTARLOT, G. **Observations pédologiques sur quelques sols des environs de Bourges (Cher).** [Pedological observations on some soils around Bourges (Cher).] *Ann. Agron.* 17, 1947 (643-657). [F.] [Ecole Nat. Agric., Montpellier]

The region around Bourges is one of slightly undulating plateaux of jurassic limestone dissected by shallow valleys. The tops of the plateaux mainly comprise calcareous, red-brown marls which are fairly stony, 15-30 cm. in depth and either directly overlie limestone or are separated from it by a bed of calcareous pebbles 30-120 cm. deep. These red-brown soils, which resemble the soils of the Mediterranean garrigues, are frequently covered by siliceous limon. They are completely cultivated, except for a few deciduous woods, and cropped to wheat, oats, barley, beet, potatoes, pasture and oil plants. At the foot of the slopes rendzinas overlie either jurassic limestone or sandy alluvium; grey silico-humus soils which have probably been washed down from the summits of the plateaux also occur. The bottoms of the flat valleys are covered by recent alluvium which may be clayey, sandy or pebbly and, where marshes occur, has a high humus content. In recent years the marshes have been reclaimed and market gardening established.

[1046] (44)633.51-1.5
LENGLEN. **La culture du coton en France.** [The cultivation of cotton in France.] *C.R. Acad. Agric.* 34, 1948 (47-55). [F.]

A historical survey covering 350 years throws doubt on the possibility of cultivating cotton economically in France.

[1047] (471)634.9-1.4
AALTONEN, V. T. Studien über die Bodenbildung in den Hainwäldern Finnlands, mit einigen Beobachtungen über ausländische Braunerden. [Studies of soil formation in Finnish woodlands, with observations concerning brown soils in foreign countries.] *Commun. Inst. Forest. Fenn.* 35, No. 1, 1947, pp. 92. [G.f.]

The soils studied are those of woodlands poor in lichens, moderately rich in bushes and rich in herbs. In South Finland they carry many tree species, but in North Finland mainly pines, with birches on the younger soils. The soils occupy about 1% of the closely forested parts of Finland, are rather heavy and often grey in colour, show a weakly leached A horizon but no sign of a podzol B horizon in the 50-60 cm. of profile investigated. The humus layer is 10-30 cm. thick. The soils exhibit considerable downward seepage of finer particles, and the depth of sampling was too shallow to permit a complete study of the distribution of grain size, Ca and inorganic colloidal complex. The characteristics of brown soils of northwestern and central Europe are similar to those of the Finnish soils studied, but the extent of typical brown soil in Finland is very small.

[1048] (485)631.459:551.55
PETERSSON, G. Vindens skadegörelse på åkerjord i Södra Sverige. Några förslag till stoftflyktens begränsning. [Damage done by wind to agricultural land in Southern Sweden. Suggestions for the limitation of soil drifting.] *LantbrHögsk. JordbrFörsöksanst. Medd.* 20, 1947, pp. 52. [Sw.e.]

12½% of the agricultural land in Sweden is annually damaged by wind. Recommendations are: better choice of crops to produce a continuous covering of the soil, smaller fields and the planting of windbreaks.

[1049] (492)631.471
EDELMAAN, C. H. Quelques résultats des travaux de la carte pédologique des Pays-Bas. [Some results of work on the soil map of Holland.] *Bull. Soc. Belge Geol.* 55, 1946 (57-66). [F.]

[1050] (495)633.51-1.5
TROUGHT, T. Cotton growing in Greece. *Emp. Cott. Grow. Rev.* 25, 1948 (29-34).

Cotton is grown easily on the alluvial soils of the valleys, but it is grown as a continuous crop and methods of cultivation are out of date. Yields could be improved considerably with better methods and machinery.

[1051] (496)634.31-1.5
BRICHET, J. A travers les orangeries du littoral Constantinois. [The orange groves of the Constantine seaboard.] *Fruits Primeurs* 16, 1946 (129-136). *Hort. Abs.* 17 (293).

Much of the citrus has been ruined by unnecessary and empirical pruning, faulty cultivation and irrigation. Cultural and manurial practices should be rationalized to take advantage of the favourable climate.

[1052] (51)631.411.2
HOU, K. C. [Properties and classification of young calcium soils in southwestern Kansu.] *Soils Quart.* 4, 1945 (19-33). *C.A.* 42 (1001).

[1053] (51)631.411.2:631.416
KUO, K. S. A preliminary observation on the limestone soils in Kwangsi. *Soils Quart.* 1, 1941 (32-47). *C.A.* 42 (1369).

Black limestone soils from rice paddies contained 3-10% of organic matter, 0.149-0.318% of total N, 0.068-0.150% of P_2O_5 , 0.062-3.235% of K_2O and 0.150-0.761% of CaO . They had a pH of 6.4-8.6, and were richer in organic matter and N than ordinary soils.

[1054] (51)631.44
HSEUNG, Y. [A suggested system of soil classification in China.] *Soils Quart.* 4, 1945 (65-74). *C.A.* 42 (1001).

[1055] (51)633.71-1.5
YU, T. T.; TSU, C. T. Studies of tobaccos cultivated in Yunnan. *J. Agric. Assoc. China* No. 184, 1947 (33-54). [Ch.e.] [Bot. Inst. Kunming]

The highest germination was obtained in seeds soaked for 3 days in water at 50°C., and the highest seedling establishment was in those sown between the end of March and mid-April. The seed-bed covers of rice straw were removed on germination but were

partially replaced on sunny days. $(\text{NH}_4)_2\text{SO}_4$ or horn meal gave the best quality of flue-cured leaf, and soybean-sauce grounds the highest yields. The best spacing was 2.5×1.5 chih. Transplanting should be done when the plants are 4-5 inches high, and topping at the time of the first bloom, leaving 15-20 leaves on the stem.

[1056] (529.1)633.71-2
MATSUMOTO, T. **Tobacco diseases in Formosa.** *Mem. Fac. Agric. Natl. Taiwan Univ.* 1, No. 1, 1946, pp. 26.

The 38 diseases noted include 11 caused by viruses, 3 by bacteria, 14 by fungi, 1 by a nematode, 1 by a mite, and 8 non-parasitic. Other virus diseases besides the 11 listed have occasionally been noticed in the field.

[1057] (54)631.459:634.9
CHATURVEDI, M. D. **Rural development in India. II. The development of forestry as the handmaid of agriculture in the United Provinces.** *Emp. Forestry Rev.* 26, 1947 (61-69).

In order to meet the fuel and small-timber requirements of the villages in the thickly populated Gangetic basin and to prevent the burning of dung, fuel-fodder reserves should be developed especially along canals, roads and railways, also uncultivated lands should be utilized. Deeply eroded clayey soils with intercalated calcareous nodules (*kankar*) will not support large-size timber trees, but respond to closure to grazing during the monsoons. In flat-bottom valleys a fair stocking of *Dalbergia sissoo*, *Acacia arabica*, *A. leucophoea*, *Azadirachta indica* and *Prosopis spicigera* has been obtained. Moisture has been conserved, and the character of the vegetation altered by plugging shoe-string gullies. Temporary protection from cattle of the eroded banks of the Ganges induces natural regeneration of *Dalbergia sissoo* and *Azadirachta indica*. Arable lands above the ravines should be protected from sheet erosion by contour terracing and bunding, maintaining a well wooded strip on the edge of the cultivated area and reducing steep gradients by terracing and bunding to fill up the valleys with alluvium. *Usar* (saline) soils will yield a fair amount of grazing by periodic closure during the rains.

[1058] (54)631.67
STAMPE, W. **Irrigation from the ground-water stimulating food production in desert areas.** *Emp. J. Expt. Agric.* 16, 1948 (47-54).

A discussion and review of irrigation possibilities in parts of India where the rainfall is erratic and deficient. A tube-well technique has proved successful in northern India and it is suggested that a thorough investigation of potentialities for applying such a technique should be initiated at an early date. The results of tube-well irrigation in the United Provinces are described.

[1059] (54)633.51-1.81
DORASAMI, L. S.; IYENGAR, G. S. **American cottons—their cultivation and breeding in Mysore.** *Indian Cott. Grow. Rev.* 2, 1948 (9-16). [Dept. Agric., Mysore]

The dry fields are usually ploughed immediately after harvest, but where the soil is too hard for ploughing a heavy blade harrow is used. 8-10 cartloads of manure are incorporated into the soil with a blade harrow. Under irrigation, cotton may be preceded by a green manure crop ploughed in 2-3 weeks before sowing.

[1060] (548)631.876
MURTHY, M. V. **A picture of our manurial problem.** *Mysore Agric. J.* 26, 1947 (10-16).

In order entirely to displace $(\text{NH}_4)_2\text{SO}_4$ by oilcakes in the manurial programme, it would be necessary to double the oilseed-crop acreage and arrange distribution of oilcake from surplus to deficit areas. At present, even if the entire groundnut and castor crop were used to produce cake as fertilizer for paddy and sugarcane it would only satisfy half the manurial requirements of these crops, without taking into consideration any other demands for oilcakes.

[1061] (548.7)633.18-1.5
NILES, J. J. **Paddy cultivation in the Jaffna peninsula.** *Trop. Agricst.* 102, 1946 (226-231).

The soils of the peninsula are neutral to alkaline and vary from loams to clay loams, organic matter and N being the main requirements. Paddy is mostly cultivated during the rainy season on the lower grey soils where drainage is imperfect. The rainwater collects in bunded fields and forms the source

of water supply. Where tank irrigation is possible paddy is followed by crops such as chillies, sunn hemp, onions, gingelly, manioc, etc. The land is manured by penning cattle in the fields during the off season and by incorporating into the soil rotted cowdung, the dried palmyrah leaves (*Borassus flabellifer*) used for thatching and sunn-hemp leaves if this crop is cultivated after paddy. Salinity is reduced in saline areas by incorporation of *illupai* (*Madhuca longifolia*) leaves. The land is ploughed during the early rains, sown and cross-ploughed. If rotated with other crops paddy is usually transplanted rather than sown direct. The average yield is 20-25 bu./acre.

[1062] (569)631.4
ZOHARY, M. A geobotanical soil map of Western Palestine. *Palestine J. Bot.* 4J, 1947 (24-35).

The map is based on a detailed reconnaissance survey and examinations of mechanical composition, moisture relationships, lime, soluble salts and organic-matter content. Nearly all the soils are calcium soils, and the high Ca content and arid sub-tropical climate do not allow of the formation of illuvial B horizons. The country is divided into 3 areas, the Mediterranean with an annual rainfall of 350-1000 mm., the Irano-Turanian with rainfall of 200-300 mm. and the Saharo-Sindian with 20-200 mm. Within each area the soils vary with the geology and topography. In the Mediterranean area the soils are (1) terra rossas, (2) rendzinas, (3) basalt soils, (4) sandy and calcareous and (5) alluvial. Soils of the other two areas are (6) grey calcareous steppe soils, (7) non-saline marls, (8) loess soils, (9) desert soils and (10) saline soils.

[1063] (661)631.4
AUBREVILLE, A. La Casamance. [Casamance.] *Agron. Trop.* 3, 1948 (25-52). [F.]

The climate and vegetation of Casamance are described. The soils are sandy, sandy-clay or clay, often with ferruginous layers cemented into a hard carapace of variable depth and thickness that is used for road making. For this reason the carapaces are known as laterites and may be hard, rocky or gravelly. Observation of fossils and several profiles has led to the hypothesis that these

"lateritic" carapaces formerly were continuous over, or slightly below, the ancient soils but now are partly broken up. The climate still favours the formation of ferruginous crusts, their depth depending on the hydrostatic level and degree of erosion. The crusts are not usually impermeable to water or tree roots unless the upper layer of soil becomes too shallow to protect them from atmospheric action, when they harden and prevent infiltration.

[1064] (661)633.18-1.67
MARTINE, P. Premiers travaux de mise en valeur du delta du fleuve Sénégal. [First efforts to develop the delta of the Senegal river.] *Agron. Trop.* 3, 1948 (3-17). [F.]

The main soil types in the Richard-Toll region of the Senegal delta comprise deeply crevassed brown or black soils containing 60% of clay (*hollaldé*) where millet is cultivated, compact siliceous-clay soils (*fondé*) containing 55-72% of fine sand, 6-12% of silt and 15-30% of clay, and sandy soils (*diéri*) which are too permeable for rice cultivation. The *hollaldé* and *fondé* have a pH value of 6, little organic matter, often a black or bluish colour due to ferrous oxide and a NaCl content of 0.32-1.6%. Preliminary experiments with rice showed that 2 l./sec./ha. of irrigation water should be applied, comprising a total volume of 16,000 cu. m. for Dissi and 18,000 cu. m. for Sikasso varieties in order to obtain adequate weed control and to prolong the vegetative cycle of the crop. Yields increased in proportion to the amount of water applied. With excess water, the Na clays, which require treatment with organic matter and CaSO₄, form a mud which the rice radicles cannot penetrate, thereby exposing the seedlings to the action of the sun and of ducks. Preliminary experiments were carried out on the growth of *Crotalaria retusa* and *C. stricta* with a view to their use as green manure.

[1065] (665.2)631.4 : 581.5
KILLIAN, C.; SCHNELL, R. Study of vegetable formations and corresponding humiferous soils of the Benna and Fonta-Djallon Mountains (French Guinea). *Rev. Can. Biol.* 6, 1947 (379-435). C.A. 42 (703). [Univ. d'Alger]

Many forest soils have been degraded into barren soils as a result of forest destruction.

Leaching is the most important factor and is greatest in sandy soils and least in clay soils. *Eriospora pillosa* clings to the rocks and favours the formation of black soil in which other species become implanted.

[1066] (669)633.51-1.5
MACKIE, J. R. **The possibilities of increased production of cotton in Nigeria.** *Emp. Cott. Grow. Rev.* 25, 1948 (4-11).

Cotton will grow wherever guinea corn will grow, whether the soil be heavy or light. There should not be serious competition with groundnuts which do best on light easy-working soils. In N. Nigeria the acreage under cotton could be increased considerably without interfering with the groundnut acreage.

[1067] (676)631.4
EAST AFRICAN AGRICULTURAL JOURNAL. **Agricultural Research Conference, Nairobi, 29th-31st July, 1947. Proceedings of the technical session.** *E. Afric. Agric. J.* 13, 1947 (67-87).

Problems discussed included: the need for ecological, soil, land-utilization and social surveys on an inter-territorial basis; biological and physical conditions in tropical and sub-tropical soils with special reference to investigations on semi-arid areas; the organic-matter cycle and soil fertility; soil structure in relation to moisture relationships, nutrient status and plant growth; influence of forests on soil moisture, streamflow and run-off; effect of different systems of pasture management on yield of arable crops; problems of leguminous crops; plant-food status, with special reference to the action of organic and inorganic fertilizers; mechanized farming.

[1068] (678)631.47
TEALE, E. O. **Undeveloped land in East Africa, with special reference to Tanganyika.** *Emp. Cott. Grow. Rev.* 25, 1948 (12-19).

Five main groups of geological formations in Tanganyika and the soils developed on them are described. (1) The Basement Complex is of only medium fertility, covers 45% of the country and includes a large proportion of the thinly populated regions. Much of the soil is mature and leached. (2) The granites are generally poor and cover

27% of the country. (3) The volcanic rocks of northern Tanganyika, the Kenya Highlands and the Southern Highlands of Tanganyika cover 2½% of the country. Owing to adverse climate and topography only a fraction of this is rich arable soil and little of these areas is available for further settlement. The main problem is the conservation of what is already occupied. (4) The sedimentary rocks form on the whole poor sandy soils. (5) The alluvial plains and swamp lands are mainly undeveloped and may have agricultural possibilities under skilled management. Some inland dischargeless basins have alkaline or saline soils and arid climates. Extremes of drought over wide areas leave little margin of safety for crop raising, and the fertile plateau areas which are favoured by good rainfall are highly susceptible to erosion.

Vast areas, for reasons of soil or climate, cannot be considered for agricultural development in East Africa. Much of the remainder is marginal and will need ameliorative treatment before it can be occupied profitably. Of the normally fertile land much is already overcrowded and deteriorating. There remain large areas of diversified soil and climate capable of development with adequate finance, but a comprehensive survey of soil, water supply and climate is essential before development.

[1069] (678)634.58-1.5
WAKEFIELD, A. J. **The groundnut scheme.** *E. Afric. Agric. J.* 13, 1948 (131-134).

An outline is given of the development of the groundnut scheme. The urgency of producing fats for Britain precluded experiments and pilot projects, but fertilizer experiments are being laid down.

This paper was also published in *Soils and Fertilizers*, Vol. 10, pp. 387-390.

[1070] (689.1)633.71-1.5
BROWN, D. D. **Dark fire-cured tobacco culture in Southern Rhodesia.** *Rhod. Agric. J.* 44, 1947 (674-693).

Dark flue-cured tobacco is cultivated in the maize belt in the Majoe district and in a few limited areas in several other districts. Good drainage is extremely important for tobacco as it is one of the most easily drowned crops known. If possible, the crop should not be planted on virgin soil, but on soil which

has been previously cropped. Some rotations are suggested but, owing to the susceptibility of tobacco to nematode attack, only plants resistant to eelworm attack should be used in the rotation. Short lists of these plants and of plants commonly used in rotation with tobacco that are hosts of tobacco root-knot nematode are given. A complete fertilizer mixture is needed for good results. The N should be derived mainly from an organic source such as fish meal. Farmyard manure or compost are also necessary.

[1071] (689.2)631.4:581.5
TRAPNELL, C. G. ; MARTIN, J. D. ; ALLAN, W.
Vegetation-soil map of Northern Rhodesia. *N. Rhod. Dept. Agric.*, 1947, pp. 20 and 2 maps.

The map, in 2 sections on a scale of 1:1,000,000, is a vegetation map with supplementary indications of major soil types occupied by each vegetation type. The considerable degree of correlation in the distribution of soils and vegetation in Northern Rhodesia has assisted in the representation of soil and vegetation in a single notation. The soil classification based on field characters, and not on analytical work, is in general accord with that used in Milne's East African soil map and with the soil groups on Van der Merwe's South African map. The soils grade from pedocal types of the lower, hotter, drier areas to two divergent moister types, the red earths and lateritic soils of the moister tropics and the podzolized soils of the more temperate humid parts of East and South Africa.

The use of vegetation as an indicator of soil fertility and the vegetation-soil unit have become the basis of a method of land survey which may be applied directly to native agriculture and to the determination of agricultural and forest potentialities. Land is classified into (1) useless land owing to shallowness of soil, seasonal waterlogging or sheer poverty, (2) partially cultivated land, largely unsuitable for cultivation, but which may be used in restricted patches for native agriculture, (3) shifting-cultivation land which is cultivated for 3-4 years, followed by a long rest of about 20 years for regeneration, (4) recultivation land which may be cultivated for 4-6 years after which it is left for partial regeneration, recultivated and then left for a long rest, (5) semi-permanent

or permanent land which is cultivated for 8-10 years and then left to rest for a corresponding period or kept under continuous alternation of cultivations and brief fallows.

[1072] (689.7)631.47
SMALLEY, D. N. **The Misuku Land Usage Scheme, Nyasaland, 1938-1947.** *E. Afric. Agric. J.* 13, 1948 (153-156).

The Misuku Land Usage Scheme covers 500 square miles of mountainous country reaching 6000-7000 feet in Northern Nyasaland. By 1937 the once well-wooded, well watered area had become badly eroded following heavy burning for the growing of finger millet. In 1938 contour planting and drainage were introduced and all bush burning forbidden. In 10 years soil erosion has been almost halted. Millet growing has been reduced to reasonable proportions and the crop is now grown only under supervised conditions. Shifting agriculture no longer exists.

[1073] (712.3)631.445.4:581.5
MOSS, E. H. ; CAMPBELL, J. A. **The fescue grassland of Alberta.** *Canad. J. Res.* 25C, 1947 (209-227). [Univ. Alberta]

Relict prairie areas in the Alberta foothill regions which are regarded as climax prairie were compared with moderately and heavily grazed grasslands. The climax prairie in black-soil zones consisted of a *Festuca scabrella* association except for a few areas where poplar and other forests occurred. In the dark-brown-soil zone the fescue was intermixed with a *Stipa* association, the climax prairie of the light-brown-soil zone. *Danthonia Parryi* appeared as a local dominant on shallow soils of rocky and gravelly slopes and, with other grasses and forbs, became prominent under mowing. This tendency was still more marked under heavy grazing when *F. scabrella* was virtually eliminated. It is concluded that the native vegetation of the black- and grey-black-soil zones was a *F. scabrella* association and that this species provided the bulk of the organic matter in the black soils. Results of the study also support the views that the chernozems are essentially grassland soils, that the prairie areas have been invaded by forest and that the forest-covered black soils have been modified by podzolization to become degraded chernozems.

[1074] (714)631.473
CANN, D. B.; LAJOIE, P.; STOBBE, P. C.
**Soil survey of Shefford, Brome and
Missisquoi Counties in the Province
of Quebec.** *Canada Dept. Agric. Exp.
Farms Serv.* 1947, pp. 84.

[1075] (729.68)551
COLONIAL OFFICE. **Annual Report on the
Turks and Caicos Islands.** *Colonial
Annual Reports* 1946, pp. 22.

A chapter on geography and climate is included.

[1076] (73)631.432
TRANSACTIONS OF AMERICAN GEOPHYSICAL
UNION. **Report of committee on ground
water, 1945-1946.** *Trans. Amer. Geophys.
Un.* 29, 1948 (117-122).

Reports from members of U.S. Geological
Survey and Soil Conservation Service from
25 states.

[1077] (73)631.47
TAYLOR, E. H. "Our changing land
policy." *J. Soil Water Conserv.* 3, 1948
(5-12, 56).

After reviewing the history of land settle-
ment and use in the U.S.A., the need is
stressed for a national land policy, which
has been absent in the past and which
comprehends an "ultimate need for food and
the basic importance of our soil reserves
to the economy and security of the nation."

[1078] (73)631.821
MEHRING, A. L. **Calcium in fertilizers.**
Soil Sci. 65, 1948 (9-25).

A discussion of the form, sources and
consumption of Ca in fertilizers in the
United States, and of the quantitative
relationship between the Ca and the N and
P content in mixed fertilizers.

[1079] (73)631.86/7
CLARK, K. G.; BEAR, F. E. **Use of natural
organics in mixed fertilizers.** *Amer.
Fert.* 108, No. 3, 1948 (7-10, 24-30). [U.S.D.A.
Beltsville, Md., and N.J. Agric. Expt. Sta.,
New Brunswick]

In 1944 the tonnage of products of process
tanks, seed meals and sewage was 60% of the
total organic fertilizers used in mixtures,
but these materials supplied 81% of the
organic N. Plant materials and peat
amounted to 1/3 of the tonnage, but they
supplied only 10% of the N.

[1080] (79)627.51
BAILEY, R. W.; CRADDOCK, G. W.; CROFT,
A. R. **Watershed management for
summer flood control in Utah.** *U.S.D.A.
Misc. Pub.* 639, 1947, pp. 24.

An account of the severe floods—the
largest for thousands of years—that occurred
at the foot of the Wasatch Mountains in the
1920's as a result of deforestation and over-
grazing on the watersheds. Some of the
flood-source areas have been contour trenched
and revegetated, and floods have become
less serious.

[1081] (798)633.2.03-1.81
IRWIN, D. L. **Forty-seven years of experi-
mental work with grasses and legumes
in Alaska.** *Alaska Agric. Expt. Sta. Bull.*
12, 1945, pp. 48. *Biol. Abs.* 21 (2021).

Broadcasting 200-400 lb./acre of $(\text{NH}_4)_2\text{SO}_4$
or spreading manure at 6-8 tons/acre on
grass meadows at the beginning of the
growing season has more than doubled the
yield of hay or pasture. Broadcasting
100 lb. of nitrate when legumes or grasses are
seeded, induces quick growth and secures a
better stand. Larger yields of grass for hay
or pasture are obtained if the land is
cultivated with a spring-tooth harrow, or
lightly disced every 2 years.

[1082] (866)631.459:631.61
ACOSTA-SOLÍS, M. **Soil erosion in the
agricultural highlands of Ecuador and
suggestions for their protection by
appropriate plants, principally by
Setaria cernua H.B.K.** *Abs. in Amer.
J. Bot.* 34, 1947 (608). [Univ. Mich., Ann
Arbor]

Setaria cernua prospers on crumbly slopes
where rain rarely falls. It has a well devel-
oped root system which holds the soil, is
evergreen and is recommended for erosion
control on the Sierra of Ecuador.

[1083] (931)633.2.03-1.58
SMALLFIELD, P. W. **Intensive grassland
farming.** *N.Z. J. Agric.* 75, 1947 (577-591).

In New Zealand, between 1920 and 1945,
carrying capacity of grassland has been
increased mainly through the use of fertilizers
and lime, especially top-dressing.

[1084] (94)631.67
 BELL, A. F. **Some administrative aspects of irrigation.** *Queensland Agric. J.* 65, 1947 (293-301).

Some observations on the investigations, planning and administrative work which must precede and accompany the successful launching of an irrigation scheme, and on the problems connected with such schemes. Shortage of water will, ultimately, be the greatest of obstacles to increased population in Australia. In Queensland the rainfall is deficient and uncertain, and increased irrigation is necessary to supplement it. Practices designed to ensure a better exploitation of the summer rainfall are necessary. In Victoria, where the greatest development of irrigation in Australia has taken place, most of the land under irrigation is taken up

by pastures. In Queensland the planning of irrigation should also place the emphasis on animal production.

[1085] (943)633.419-1.81
 CARTMILL, W. J. **Fertilizing potatoes in the Lockyer valley.** *Queensland Agric. J.* 64, 1947 (69-74).

Clay loams and clays predominate in the valley. P status is high and P is present in readily available form. The lighter soils are low in N and high in K; heavier soils have a fair N and satisfactory K content. A leguminous crop should be ploughed in before planting potatoes. The use of K fertilizer is not advised although a soil repeatedly cropped to potatoes could become K-deficient. P fertilizer and lime or dolomite are unnecessary.

INDEX TO AUTHORS

- Aaltonen, V. T., 1047
 Acosta-Solis, M., 1082
 Adams, J. R., 922
 Afanasiev, M. M., 992
 Aguiar, J. F., 879
 Ahlström, B., 1033
 Akiyama, K., 843
 Alarie, A. M., 857
 Albareda Herrera, J. M., 759, 762
 Aleixandre Ferrandis, V., 759, 826
 Alfani, A., 866
 Allan, W., 1071
 Andersen, S., 945
 Anderson, E. J., 1025
 Anderson, H. W., 861
 Andrews, R. K., 808
 Andrews, W. B., 913
 Aquino, D. I., 816
 Aries, R. S., 924
 Aronovici, V. S., 798
 Atkinson, H. J., 872
 Aubréville, A., 1063
 Ayers, A. D., 765
- Bahrt, G. M., 920
 Bailey, R. W., 841, 1080
 Baker, G. O., 837
 Barbier, G., 916
 Bates, R. G., 768
 Batjer, L. P., 1011
 Bauer, F. C., 835
 Baumann, H., 809
 Bear, F. E., 802, 888, 889, 1079
 Bedell, G. D., 832
 Bell, A. F., 1084
 Benson, N., 1008, 1010, 1012
 Berger, K. C., 970
 Bergh, H., 785
 Bertrand, G., 780
 Bhattacharyya, P. K., 861
 Bilian, Z., 986
 Bjälve, G., 856
 Blackman, G. E., 979
 Bonnemaison, L., 935
 Bottini, E., 950
 Bradfield, R., 749, 793
 Bradley, W. B., 772
 Brady, N. C., 1018
 Bransford, A. V., 938
 Brener, W. H., 1029
 Brichet, J., 1051
 Broadbent, F. E., 1021
 Brown, C. B., 828
 Brown, D. D., 1070
 Brownings, G. M., 803, 811, 880
 Brun, E., 747
 Burd, J. S., 774
 Burmann, F. W., 977
 Buron, P., 1035
 Burriel Martí, F., 792
 Byers, H. G., 779
- Cady, J. G., 756
 Caillère, S., 761
 Camargo Mendes, H., 796
- Campbell, J. A., 1073
 Cann, D. B., 1074
 Cannière, J. De, 815
 Cannon, H. B., 1038
 Carrante, V., 1022
 Carreker, J. R., 833
 Cartmill, W. J., 1085
 Casagrande, A., 819
 Chabannes, J., 916
 Chalaust, R., 847
 Chambers, T. B., 871
 Champlin, M., 947
 Chaturvedi, M. D., 1057
 Cheng, Y. P., 836
 Choudhury, J. K., 980
 Claerhout, L., 881
 Clark, K. G., 1079
 Clarke, F. E., 853
 Clawson, O. T., 1009
 Coic, Y., 974
 Colwell, W. E., 1018
 Connin, R. V., 953
 Cooley, J. S., 1013
 Cooper, H. P., 887
 Cowie, G. A., 1044
 Craddock, G. W., 1080
 Crafts, A. S., 944
 Crandall, B. S., 1023
 Croft, A. R., 1080
 Crowther, E. M., 1043
 Cummings, R. W., 906
- Davel, H. B., 910
 Davidson, O. W., 901
 Deas, C. P., 928
 Decoux, L., 984, 985
 Demon, L., 747
 Depardon, L., 1035
 Dickey, P. B., 959
 Dobrzański, B., 751, 812, 820
 Dominik, T., 1031
 Donnan, W. W., 882
 Dorasami, L. S., 1059
 Ducker, H. C., 975
 Dupuis, J., 760
- Eaves, C. A., 1038
 Edelman, C. H., 1049
 Edwards, F. E., 913
 Eglitis, M., 978
 El-Helaly, A. F., 949
 Ellerton, S., 988
 Ellinger, G., 799
 Engle, L. I., 816
 Eppson, H. F., 772
 Espino, R. B., 932
 Ewan, M. A., 909
- Felton, M. W., 973
 Ferguson, W. S., 961
 Ferrière, C., 933
 Fina, A. L. de, 863
 Fletcher, J. E., 824
 Ford, O. W., 909
 Franco, C. M., 796
 Fruhauf, B., 827
- Fuhr, I., 938
 Fujimoto, C. K., 788, 930
- Galvez, N. L., 801
 Garman, W. H., 887
 Gerretsen, F. C., 777
 Gethin Jones, G. H., 919
 Gilbert, C. S., 772
 Gilbert, F. A., 995
 Gisiger, L., 951
 Glenn, E. M., 1017
 Gottlieb, D., 861
 Graham, E. R., 794
 Gray, P. H. H., 857
 Griffith, A. L., 1028
 Guiscafé-Arillaga, J., 997
 Gurr, C. G., 818
 Guseinov, D. M., 921
- Hammons, J. G., 913
 Hansel, R. L., 963
 Hansen, P. L., 1000
 Hardin, L. J., 915
 Hargreaves, M. W. M., 875
 Hartsuyker, K., 989
 Hasler, A., 951
 Heath, O. V. S., 1034
 Hendrickson, B. H., 834
 Hénin, S., 760, 761
 Hermansen, J., 945
 Hernando Fernandez, V., 792
 Hester, J. B., 797, 905
 Hickok, R. B., 832
 Hine, H. J., 804
 Hing, W., 1008
 Hinkle, D. A., 976
 Hiroux, G., 795
 Hoglund, O. K., 959
 Holdsworth, M., 1034
 Holly, K., 979
 Holmbäck, B., 1032
 Hoover, C. D., 781
 Hopkins, D. P., 884, 902
 Hou, K. C., 1052
 Hoyle, S. T., 975
 Hseung, Y., 1054
 Hsieh, T. C., 836
 Humbert, R. P., 756
 Hurwitz, C., 786
- Inforzato, R., 926
 Irwin, D. L., 1081
 Iwata, Y., 927
 Iyengar, G. S., 1059
 Iyer, C. R. H., 752
- Jackson, M. L., 757
 Jacobson, L., 900
 Jamison, V. C., 1015
 Jensen, H. L., 851, 855
 Jensen, S. T., 904
 Jones, D. P., 991
 Jones, D. Price, 993
 Jones, F. G. W., 993
 Jones, M. A., 868
 Joret, G., 795, 971

- Kern, W., 789
 Killian, C., 1065
 Kipps, E. H., 965
 Kiryū, T., 843
 Kjær, B., 904
 Koch, D. E. V., 787
 Kohnke, H., 832
 Kovats, L. T., 791
 Kruger, T. L., 1014
 Krumm, C. J., 1029
 Krynine, P. D., 817
 Kulash, W. M., 934
 Kuo, K.-S., 1053

 Lagasse, F. S., 1001
 Lajoie, P., 1074
 Lakin, H. W., 779
 Lakshmikantam, M., 982
 Lambin, A. Z., 823
 Lambina, T. F., 823
 Lane, K. S., 755
 Larson, C. A., 874
 Lauritzen, C. W., 805
 Lear, B., 937
 Lees, H., 848, 849
 Lemmermann, O., 903, 908
 Lenglen, 1046
 Lobanov, N. V., 807
 Lombard, F. F., 1003
 Loustalot, A. J., 1001

 McCulloch, A. W., 748
 McEvoy, T., 1042
 McIntire, W. H., 915
 McKay, H. C., 837
 Mackie, J. R., 1066
 McKnight, T., 852
 Madson, B. A., 959
 Maier, E. A., 912
 Malmström, C., 1032
 Malowany, S. N., 859
 Malterre, H., 795, 971
 Mangual, J. C., 941
 Marchesi Sociats, J.-M., 1039
 Marimpietri, L., 773
 Marquis, A., 916
 Marshall, C. E., 765, 783
 Martin, J. D., 1071
 Martin, W. P., 824
 Martine, P., 1064
 Marx, T., 907
 Masefield, G. B., 876
 Mason, R. S., 790
 Matsumoto, T., 1056
 Mehring, A. L., 1078
 Meiklejohn, J., 849
 Mériaux, S., 761
 Michael, G., 908
 Michaud, R., 758
 Michel, A., 1026
 Mighell, R. L., 1000
 Miles, I. E., 753, 964
 Mitchell, R. L., 784
 Mogilner, I., 877
 Montarlot, G., 1045
 Morel, R., 810
 Moretti, O., 878
 Morris, H. E., 992
 Moss, E. H., 1073
 Muckel, D. C., 806

 Mulder, E. G., 842
 Munson, E. P., 911
 Murthy, M. V., 1060
 Myhre, A. S., 1024

 Nelson, C. E., 874
 Newhall, A. G., 937
 Newton, J. D., 859
 Nikofoff, C. C., 756
 Niles, J. J., 1061
 Nissen, O., 968
 Nixon, W. M., 840
 Norman, A. G., 845, 942
 Novák, V., 864

 O'Brien, R. E., 967
 Odland, T. E., 873
 Ogg, W. G., 750
 Okazaki, R., 800
 Olson, L. C., 917
 Opitz, K., 885
 Orr, R. E., 831
 Overley, F. L., 1007, 1010, 1012
 Overstreet, R., 900

 Paden, W. R., 887
 Pagan, C., 868
 Pang, C. Y., 836
 Parr, C. H., 918
 Pedersen, A., 945
 Peech, M., 793
 Peavy, W. J., 845
 Pelíšek, J., 821, 825
 Perkins, A. T., 775
 Peterson, J. B., 754
 Petersson, G., 1048
 Pierre, W. H., 776, 782
 Pillai, S. C., 929, 983
 Potter, G. F., 920
 Potter, W. D., 862
 Potts, R. C., 963
 Powers, W. L., 766, 770, 999
 Previtera, A., 858
 Purvis, E. R., 901

 Quastel, J. H., 799
 Questel, D. D., 953

 Rajagopalan, R., 929, 983
 Raney, W. A., 781
 Rao, W. V. B. S., 844
 Reed, J. F., 906, 1018
 Reifenberg, A., 883
 Reith, J. W. S., 914
 Reynolds, E. B., 778
 Rhind, D., 956
 Rhoads, A. S., 1016
 Richard, J., 994
 Riecken, F. F., 880
 Rodriguez Muñoz, C., 762
 Rogers, H. T., 1020
 Rosovsky, R., 883
 Ross, W. H., 922
 Rossiter, R. C., 965
 Russel, J. C., 813
 Russell, E. W., 867
 Russell, H. W., 808

 Sahm, U., 907
 Sankaram, A., 982
 Sarasola, A. A., 870
 Sauchelli, V., 886
 Schall, E. D., 909
 Schmidt, C. T., 939
 Schmidt, O. C., 854, 908
 Schneider, H., 1005
 Schnell, R., 1065
 Schwartz, C. D., 1024
 Sell, O. E., 917
 Shaw, W. M., 915
 Sherman, G. D., 788, 930
 Shirlow, N. S., 1037
 Sieling, D. H., 763
 Silver, S. D., 938
 Simington, R. C., 1040, 1041
 Simon, M., 984, 987, 990
 Skelton, D. W., 967
 Smalley, D. N., 1072
 Smallfield, P. W., 1083
 Smith, D. D., 838, 865
 Smith, G. E., 905
 Smith, J. B., 873
 Smith, J. C., 778
 Smith, M. S., 936
 Sprague, V. G., 957
 Stampe, W., 1058
 Stanford, G., 782
 Staten, G., 976
 Stoa, T. E., 962
 Stobbe, P. C., 1074
 Storey, I. F., 948
 Subrahmanyam, V., 752, 929, 983
 Swallers, C. M., 962

 Tamm, C. O., 1030
 Tarr, H. L. A., 928
 Taylor, E. H., 1077
 Teale, E. O., 1068
 Teichner, S., 764
 Terasmae, E., 1033
 Thompson, J. C., 972
 Thornton, G. D., 1021
 Thung, T. H., 981
 Tincker, M. A. H., 1034
 Tkatchenko, B., 996
 Toh Jin Siong, 801
 Tommasi, G., 773
 Tóth, L., 850
 Toth, S. J., 802, 888, 889
 Trapnell, C. G., 1071
 Trought, T., 1050
 Trumble, H. C., 960
 Truog, E., 771
 Tsu, C. T., 1055

 U Tin, 956
 Uhland, R. E., 834

 Valentine, K. A., 822
 Vandecaveye, S. C., 800
 Van Doren, C. A., 835
 Van Overbeek, J., 943
 Vergnaud, H., 846
 Verona, O., 860
 Viro, P. J., 1027
 Vogt, T., 785

Wakefield, A. J., 1069
 Wall, A., 947
 Wallace, A., 802, 889
 Walters, A., 952
 Wang, T. C., 1036
 Waring, E. J., 1037
 Washburn, D. E., 755
 Watson, E. F., 925
 Wauthy, R., 984
 Weaver, W. D., 814
 Weeks, M. E., 952

Wheeler, T. S., 1040, 1041
 White, D. G., 868, 869
 White, J. L., 757
 Whittaker, C. W., 922
 Wilcox, J. C., 1006
 Wilde, S. A., 1029
 Williams, E. G., 914
 Wilson, H. A., 803, 880
 Wilson, R. D., 1037
 Wiltshire, G. R., 830
 Winters, H. F., 1002

Woodruff, C. M., 865
 Worsham, W. B., 808
 Wright, L. E., 872
 Wu, T. S., 927

Yu, H., 767
 Yu, T. T., 1055

Zohary, M., 1062

SOILS AND FERTILIZERS

Vol. XI

1948

No. 4

THE C.A.B. CONFERENCE ON TROPICAL AND SUB-TROPICAL SOILS

by
F. HARDY

A Conference on Tropical and Sub-Tropical Soils was held under the aegis of the Commonwealth Agricultural Bureaux at Harpenden, England, during the week June 14 to June 19, 1948. It was followed by a week's excursion which started at Oxford on June 20, and ended at Lyndhurst, Hampshire, on June 26.

The Conference, which was opened by Mr. D. R. Rees-Williams, M.P., Under-Secretary of State for the Colonies, comprised four morning sessions at which papers were presented and briefly summarized by their authors, and four evening sessions at which the subjects introduced in the papers were discussed. Final discussions were held at Rothamsted on Saturday morning of the conference week, and at Lyndhurst on Friday evening of the excursion week.

During the afternoons of the conference week, visits were made, at the kind invitation of the Director of Rothamsted, to the farm and to the laboratories of the Rothamsted Experimental Station. The third day of the conference week was set aside for an excursion to the Cambridgeshire Fens.

Entertainment was provided for the delegates at an informal evening reception at Rothamsted on the first evening of the conference week, and at a garden party given by the Director of Rothamsted at his home. By special arrangement many delegates were able to attend the dress rehearsal of the pageant commemorating 1,000 years of St. Alban's history on the last evening of the conference week. At Oxford, H.M. Government gave a luncheon at which the Earl of Listowel, Minister of State for the Colonies, presided.

The Conference

The delegates represented five Dominions (Australia, India, New Zealand, South Africa and the United Kingdom), thirteen Colonies and Dependencies (Cyprus, Gold Coast, Jamaica, Kenya, Malaya, Nigeria, Nyasaland, Sierra Leone, Southern Rhodesia, Anglo-Egyptian Sudan, Tanganyika, Trinidad and Uganda) four administrative and research organizations (the East Africa High Commission, the East African Agricultural and Forestry Research Organization, the Food and Agriculture Organization and the Imperial College of Tropical Agriculture) and five foreign countries (Belgium, France, Holland, Palestine and U.S.A.).

The first session was devoted to a review of tropical and sub-tropical soils. Twelve papers were presented, describing the soils of such widely differing regions as Australia, South Africa, Uganda, Nigeria, Belgian Congo, Senegal, Northern and Southern Rhodesia, Madagascar, Zanzibar and Fiji. The discussion brought out clearly the lack of unanimity among experienced soil scientists regarding the exact definition of "podzol", "laterite", "rendzina" and other well-known names for Great Soil Groups. It also afforded an opportunity for members who had closely investigated certain widespread tropical and sub-tropical soil groups, such as "Ando", an immature soil developed over recent volcanic ash, reported from Japan, and "Tropical Black Clay", a deeply-cracking heavy soil developed over many different kinds of parent rocks, though chiefly over basic igneous rocks, that possibly includes the "Black Cotton Soil" of India, though differing fundamentally from chernozem.

At the second session thirteen papers were presented, describing systems and methods of tropical and sub-tropical soil classification and soil surveying. The discussion brought out no consensus of opinion regarding the precise meaning of certain pedological terms, "terra rossa" for example, and indicated the need for a Central Committee to which these terms might be referred, and which might also collate the data and information available in different countries, leading eventually to better systems of soil classification. The detailed examination of "sample areas" was recommended as a useful method of surveying new terrain, and the value of aerial photographs as an aid to soil mapping was also stressed. The applicability of colour photography for recording the appearance of representative soil profiles was discussed, and later, at Oxford, some striking examples of Kodachrome pictures of profiles were exhibited by Mr. J. Thorp (U.S.A.).

The third session dealt with fertility problems, and included papers on the planning and designing of fertilizer experiments, and on fertility problems of the so-called "lateritic" soils—specifically of the Netherlands East Indies, Uganda, Northern Nigeria and the Sudan. In the discussion, the response to lime of certain lateritic soils, notably those of South Africa, Kenya, Puerto Rico and the Netherlands East Indies, was described by several delegates. The advantages of fractional fertilizer applications in the growing of tobacco in Southern Rhodesia and of maize in the United States were stressed, and the importance of spacing in maize production was indicated. The question of fertility maintenance by means of grass leys, cover crops and bush fallows and the significance of the nitrogen cycle in soils were considered. The implications of the term "quality", applied to tropical crops, were briefly discussed, with reference to coffee, tea, rice and groundnuts. Finally, the need for further extension work, aimed at encouraging native agriculturists to use more fertilizers, and for more intensive research work on tropical agricultural problems was emphasised.

The fourth session dealt with soil erosion and various miscellaneous problems such as the determination of the phosphate status

of soil, the effect of nitrogenous and phosphatic fertilizers on rubber trees in Malaya, the nutrient relationships of West African banana soils, and the peculiar vegetational conditions in the Algerian Steppes. The discussion mostly concerned soil-conservation methods, particularly the use of terraces, and legislation for enforcing anti-erosion measures. The soil-phosphate question and the problem of the nitrogen balance in soils were considered in some detail. The special manurial problems involved in rubber growing were indicated, and the usefulness of routine chemical soil analysis based on the establishment of arbitrary limits of adequacy of plant nutrients in the soil was debated.

The Excursions

The visit to the Cambridgeshire Fens gave the delegates an opportunity of seeing something of the conditions prevailing in this unique part of England where drainage problems have exercised the ingenuity of engineers and farmers during the past three centuries.

At Oxford, visits were made to the large collection of monoliths, many of tropical soils, housed in the Soil Science Museum.

Two full-day excursions and one half-day excursion were made from Oxford. The main purpose of the first excursion was to inspect the very fertile red soils formed on the Middle Lias in North Oxfordshire, and some expert reclamation work carried out on the site of large ironstone workings where the topsoil is replaced after the ironstone has been removed. A striking contrast was seen between these fertile soils and adjacent, highly podzolized Northampton Sands.

A second excursion was to the Vale of Evesham where some of the finest Cotswold scenery was seen. The characteristic brown soils were studied in several cuttings and their relationships to Brown Forest Soil and to Rendzina were discussed. The grey clay soils of the Vale of Evesham, which supports tree fruits and market-garden crops, were also examined, as well as some gravel soils developed over river terraces. The third excursion concerned the forest soils and forest nurseries at Bagley Wood and Kennington, not far from Oxford. The soil-profile

changes that had gone on since the original beech-oak forest had been replaced in 1904 by different types of coniferous forest were studied in a series of shallow pits. Nutrition problems in the forest nursery were considered in particular relation to soil reaction and lime status, so far as they affect Sitka spruce grown in a slightly calcareous clay soil. The response of Sitka spruce to mineral fertilizers and to renovating crops grown in rotation was noted.

From Oxford, the party moved to Lyndhurst via Marlborough, Amesbury (where a visit was made to Stonehenge) and Salisbury (where the cathedral, as well as the pre-historic fortress of Old Sarum, were visited). *En route*, numerous stops were made to examine soils developed over Calcareous Grit, Greensand and Chalk. The final excursion was through the New Forest to Wareham Heath. Planting-out experiments with Sitka spruce and Scots pine under different manurial treatments and nursery experiments with fertilizers and lime were inspected. The soil is a gley type, strongly podzolized, often showing a humic iron-pan, developed over Bagshot Sands (Eocene). It has a thick upper layer of heavily leached, grey acid sand, very deficient in plant nutrients. Several profile sections of this soil were studied. It has been shown that coniferous trees can be grown successfully on it if it is treated with composts, presumed to encourage mycorrhiza formation, but excellent seedlings of conifers have also been grown with complete mineral fertilizers alone, and transplants have so far done well in the forest.

Final Recommendations

At the opening session of the Conference, two committees were appointed for the purpose of reporting on (1) what measure of agreement exists on methods and systems of classification of tropical and sub-tropical soils, and what future lines should be followed in soil surveying and in the study of the soil in the field and the laboratory, and (2) what

steps should be taken to co-ordinate and provide work on the enhancement of soil fertility with special reference to field experiments on manuring and cropping systems.

These two committees, after a preliminary discussion at Rothamsted on the last morning of the conference week, presented their reports at the final session held at Lyndhurst.

The main points on which recommendations were made were:—

(1) The need for greatly increased staffs and improved facilities for training soil scientists for work in the tropical regions of the Commonwealth.

(2) The desirability of appointing a Central Committee to act as a "clearing house" of information and to keep under constant review the nomenclature of soil science, the definitions proposed for soil terms, and the systems suggested for soil classification, so that progress might be made towards uniformity and precision. The Central Committee might also be called upon to advise on the details of soil mapping, soil description and soil-map construction.

(3) The need for some central laboratory to which soil samples and materials could be submitted for examination by routine analytical methods, X-ray analysis and spectroscopic analysis.

(4) The need for soil-fertility committees to be set up within each of the main tropical and sub-tropical regions, that would be responsible for the planning and co-ordination of field experiments, and the conduct of relevant laboratory investigations in soil-fertility problems.

(5) The need for some central statistical research institute to which the results of experiments could be sent for statistical analysis.

SUMMARY OF REPORTS

Reports received include: *Barbados*, Report of the Department of Science and Agriculture 1946-47; *Canada*, Report of the *Science Service*, *Dominion Department of Agriculture* 1946-47; Report of the Department of Agriculture, *New Brunswick*, 1946-47; Report of the Department of Agriculture and Marketing, *Nova Scotia* 1946-47; Report of the Department of Agriculture, *Prince Edward Island* 1946-47; *Carnegie Institution of Washington* Yearbook 1946-47; *Ceylon*, Report of the work of the *Rubber Research Board* 1946; *Ceylon Coconut Research Scheme* Reports 1944 and 1945; *Colonial Office*, *Colonial Annual Reports* 1946 for Aden, Bahamas, Bermuda, British Honduras, Caicos Islands, Cayman Islands, Cyprus, Gambia, Gibraltar, Gold Coast, Mauritius, Nigeria, Nyasaland, Seychelles, Sierra Leone, St. Vincent, Swaziland, Tonga, Trinidad and Tobago, Uganda and Zanzibar; *Congo Belge*, *Rapport de l'Institut National pour l'Etude Agronomique du Congo Belge* 1946; *Dominica*, Department of Agriculture Report 1946; *Empire Cotton Growing Corporation*. Reports from Experiment Stations 1946-47 and Programmes of Experiment Stations 1947-48; *Hawaiian Sugar Planters' Association* Report 1946-47; *Imperial Forestry Institute*, Oxford, Report 1946-47; *Imperial Institute* Report 1947; *Irish Agricultural Organization Society Limited*, Report 1947; *John Innes Horticultural Institution* Report 1947; *Malaya* Report on Agriculture 1946; *Mauritius* Department of Agriculture Report 1946; *Queensland Bureau of Sugar Experiment Stations* Report 1947; *St. Vincent* Department of Agriculture Report 1946; *Sierra Leone* Department of Agriculture Report 1946; *Singapore* Annual Report 1946; *Southern Rhodesia Report of the Natural Resources Board* 1947; *Trelawney Tobacco Research Station*, Southern Rhodesia, Report 1947; *Swedish Institute of Agricultural Engineering* Report 1946-47; *United States Department of Agriculture* Agricultural Research Administration Report on Experiment Stations 1947. *Victoria State Rivers and Water Supply Commission* Report 1946-47; *West African Cacao Research Institute*, *Tafo*, Quarterly Report January-March 1948; *United States Agricultural Experiment Stations*. *Georgia* 1946-47; *Purdue University*, *Indiana* 1946-47; *West Virginia* 1944-46.

Barbados.—Sugarcane trials with NPK. Comparison of the effects of artificial and pen manures on the humus of sugar-cane soils. Investigations of exchangeable-K content of sugar-cane soils. Soil survey.

Canada.—*Report of the Science Service*. Investigations on composition of colloidal fractions of soils. Investigations of long-time effect of adding different kinds of organic matter on the chemical composition and physical properties of soil. Tests on the fertilizer value of ammoniated waste-sulphite liquor product. Crop rotations and green-manuring experiments. Study of the intake of B in relation to the application of K to maize, potatoes and oats. Effect of water-soluble B, soil pH, N, available P and exchangeable Ca, Mg and K on brown-heart in turnips. Co deficiency in soils. Study of mechanical analysis, moisture equivalent and colloids in eroded soils.

Laboratory methods. Use of rapid soil tests for determining available plant-food constituents. Plant-tissue tests for N, P, K on sodium-acetate extracts of leaves. Foliar diagnosis. A proposed method for determining adsorbed P as a measure of that fraction which is readily available to plants. Investigations of the part played by hydrated oxides of Fe and Al in adsorbing phosphates and of the release of this adsorbed P by the fluoride ion.

Nova Scotia.—Soil survey. Experiments on the effect of lime and fertilizers on grain and hay yields. Comparison of results obtained from fertilizers under greenhouse conditions and under field conditions. Greenhouse and field experiments with granulated blast-furnace slag on grain, hay and orchards. Co-deficiency studies.

Ceylon.—*Rubber Research Board*.—Manuring mature rubber with NPK. Comparison of results from fertilizer broadcast and fertilizer forked in. Manuring young rubber with NPK and compost. Comparison of applying P to young rubber on the surface and at 6 inches depth. Effect of super. and rock phosphate.

Ceylon.—*Coconut Research Scheme.* Influence of manuring on copra, development of female flowers and setting of nuts. Manurial experiments with young palms. Cover crops. Manurial constituents in pasture samples after application of NPK. Available P in plots receiving NPK.

Congo Belge.—Effect of clean weeding and cover crops on coffee yields. Effect of organic manures on palms and bananas. Fertilizers for sisal.

Dominica.—Fertilizers for sugar cane. Trials with fully rotted and unfermented pen manure, mulch + $(\text{NH}_4)_2\text{SO}_4$ and complete inorganic fertilizers on sweet potatoes and maize under heavy rainfall.

Empire Cotton Growing Corporation.

Queensland.—Soil-structure studies. Rotations with sorghums and Rhodes-grass leys. Soil moisture and nitrification; effect of low winter and spring rainfall on the nitrate content of the surface soil. **Uganda.**—Fertilizer trials with rock phosphate and silicophosphate, $(\text{NH}_4)_2\text{SO}_4$ and K_2SO_4 on cotton and groundnuts. **Tanganyika Territory.**—Land-resting trials under elephant grass. Experiments with farmyard manure, compost, cotton-seed ash and leguminous green manures. Effect of silicophosphate and super. Tie-ridging on heavy soils in a year of high rainfall. **Nyasaland.**—Comparison of resting crops of elephant grass, velvet bean, pigeon pea, chance weeds burnt each year, chance weeds protected from fire, and perennial sorghum for 2, 3, 4, 5 and 6 years' rest. Mixed cropping of cotton and maize. Rotations of maize and groundnuts. Soil-structure studies on reddish brown and black soils from fields at different stages of cultivation and from undisturbed bush land. **Antigua.**—Effect of NPK and pen manure on yields. Effect of time of application. Rotations with elephant grass, sugar cane, green-manure crop, food crops, bare fallow and weed fallow. **Montserrat.**—Experiments with NPK and pen manure. Rotations with weed fallow, bare fallow, green-manure crop, cane, food crops and elephant grass.

Hawaii.—Studies of correlation between the amounts of CO_2 evolved by soil organisms and the numbers of fungi and bacteria in the soil. Relationship between numbers of soil

organisms and soil fertility. Use of leaf-punch technique for guidance in N fertilization. Effect of climate on the use of N and K. Irrigation-interval tests. Soil fumigation with D-D. Weed control with chemical sprays. Spectrographic analyses of soils and plant materials.

Imperial Forestry Institute.—Soil ecology and microbiology. Butt-rot of conifers and water-air regime of the soil. Association between root infection with species of *Phytophthora* and *Pythium* and badly drained subsoil.

Mauritius.—Effect of compost, applied after burning, on tobacco seed beds. Experiments on diagnosis of nutrient deficiency by injection. Rotations for tobacco. Foliar diagnosis studies on sugar cane. Experiments with weedkillers.

Queensland.—Fertilizer trials with N, P, K, Cu, Mn, Zn and B and plant-residue trials on sugar cane. Effect of time of application of K on date of maturity. Erosion control by planting late varieties. Trials with *Crotalaria* as a green-manure crop and legumes for cover crops. Trial plantings of ramee. Fertilizer-placement trials. Placement trials of Gammexane for control of grey back cane beetle. Gammexane for control of wireworms. Resistance trials of ratoon crops to Fiji disease.

Sierra Leone.—Establishment of rice growing on reclaimed mangrove swamp, saline-swamp reclamation and inland-swamp cultivation of rice in the wet season, and market-garden crops in the dry season. Investigation of soil toxins in empoldered areas on which rice cultivation failed. Observation tests on the effect of dry-season treatments on the ensuing wet-season rice crop.

Southern Rhodesia. *Natural Resources Board.*—Extension of Intensive Conservation Areas. Experiments with gully control. De-stocking, centralization of grazing reserves and fencing in native areas.

Southern Rhodesia. *Trelawney Tobacco Station.*—Rotations with sunnhemp, munga, maize, dahl, cotton, velvet bean, Rhodes

grass and fallow. Use of compost on tobacco and Sudan grass. Experiments with time of ploughing. Soil-insecticide tests with Gammexane and DDT. Cyanamide for weed control in seed beds and for control of eel-worm.

United States Department of Agriculture, Research Administration.—

California.—Fruit trees injured by excess of B in irrigation water. *Indiana.*—Crop yields have declined on soils containing sufficient plant nutrients, but deficient in air supply. *Mississippi.*—Investigations of the desired balance between air, water and plant nutrients in soil, especially as they affect cotton roots and growth. *New York State (Cornell).*—Influence of soil reaction on potato yield, protein content, maturity and scab infection. *New York State (Geneva).*—Ground limestone increased yields of tomatoes on acid soils. *Ohio.*—Orchard mulching increased nutrients, particularly K, in the soil and increased depth of penetration of P into the soil. N in leaves of apple trees reflected the nutrient condition of the tree and was a reliable index to the N requirement of the tree. *Vermont.*—Increasing fertilizing value of manure by adding super., lime, N and K. Use of borax or boric acid for killing fly larvae in manure. *Washington.*—Investigations on the restoration of arsenic-toxic soils (caused by spraying with As to control codling moth) by growing As-tolerant plants and by treating the soil with chemicals to convert As residues into harmless compounds.

United States Experiment Stations

Georgia.—Fertilizers for cotton, maize, tobacco and peanuts and other crops in rotation with peanuts; methods of application. Experiments with N/K ratio of fertilizers on cotton; effect of peanuts on cotton land. Heavy rates of N fertilizers for maize and close-spacing tests. Cyanamide for weed control in tobacco.

Purdue.—Tillage and fertilizers for maize. Fertilizers and straw mulch for tomatoes. Response of soybeans to super., rock phosphate and N; influence of soybeans on soil conditions and on growth of subsequent legume crops. Soil management and fertilizers for apple trees and stone fruit trees. Cumulative effects of different systems of soil treatments on soil fertility. Needs for K, Mn, B and S in Indiana soils. Effect of water levels in muck soils on yield and quality of crops and on physical characteristics of soils. Revegetation of coal-mine spoil banks. Condensation and adsorption of atmospheric water as a source of soil moisture. Survey of iodine in water, soil and crops of Indiana.

West Virginia.—Fertilizers; application of N to tobacco; P and lime for pastures; by-products of sugar beet industry as fertilizers for potatoes; fertilizer placement for potatoes. Reclamation of strip-mined lands. Bark disease of apples caused by excess Mn. Soil fumigation with fungus-killing chemicals for the control of black root rot of apples.

A CATALOGUE OF INSECTICIDES AND FUNGICIDES

(Compiled by Donald E. H. Frear. *Chronica Botanica Co.*, Waltham, Mass., U.S.A.
Pp. 203. Price \$6.50).

Every worker in the field of insect pest and fungus disease through the agency of chemicals is faced with the dimensions of his subject and the pace and acceleration with which it grows. The card index of its literature taxes both energy and above all skill in its compilation, if the task of referring to particular items is not to be almost impossibly onerous. This is true of almost all branches of pure and applied science, and the facilitation of recording, cross-referring and sorting out of items of interest and importance is becoming one of the major problems of research. Doubtless in the course of time a mechanical or electronic means of carrying these out will be achieved, and on an international scale, and the subject dealt with by Professor Frear allotted some range of numbers in some sub-section of the colossal scheme of human knowledge. A casual inspection, however, of Volume I of Professor Frear's book gives an indication of how complex an issue is involved in cataloguing the chemical compounds used in insect-pest and fungus-disease control. In addition, a number of other branches of science besides chemistry are implicated and far from being a highly specialized branch of applied science, it covers a great range of chemistry, biology, physics and engineering, including aeronautics; moreover the entomologist, mycologist, medical and plant pathologist, the agronomist, the public health officer and the statistician are all involved; not to mention the farmer, the horticulturist, the gardener and housewife. Professor Frear has put to himself the question: how can I give a bare recording of the chemicals tested for their insecticidal purposes and such references as will enable a research worker to get at least a summary of the information existing on this subject? This book is the result, and it must have entailed a devotion and a concentration of labour almost beyond praise.

A very large number of chemical compounds are listed, *not* alphabetically, but by code numbers and are named according to the nomenclature of the American Chemical Society, although, as far as one can judge, the common name of the material is generally given. If the book is to be used with effect it is necessary for the reader or reference maker to master thoroughly the Introduction in which the relatively simple coding system is explained, otherwise it will be well nigh impossible to make one's way through the vast array of chemical compounds listed here. An alphabetical index of the compounds is apparently relegated to Volume II, and this is unfortunate as one finds it difficult to believe that anyone, not having a good working knowledge of chemistry, will be able to use the catalogue with the fullest advantage. A competent chemist who acted as test subject was able after reading the introduction once to find rotenone in 2½ minutes, DDT one minute, γ -BHC in fifteen seconds, but the pyrethrins are apparently not included or at any rate were not found in an hour's search, although other chrysanthemumic esters were readily discovered.

The value of the catalogue would have been increased by a brief collected bibliography of the various monographs which have been published on particular insecticides and the more important reviews, and one hopes that future editions will have many more references to European literature. But this book is a first edition and a brave start, and one hopes that those who use it will respond to the author's request for suggestions and constructive criticism and correction, as well as by sending contributions of information about compounds not listed.

F. TATTERSFIELD

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages. Where the Bureau has only seen an abstract, and not the original paper, no language indication is given.

Original (untranslated) titles of papers are only given where the Latin script is used.

Where more than one reference is given, the first is to the original paper, the others to notices in abstract journals. A key to the abbreviations used in the references is contained in the Bureau's *Bibliography of Soil Science, Fertilizers and General Agronomy*.

631.4 SOILS

(See also Abs. Nos. 1249, 1250, 1382)

[1086] 631.4: 577.16
ROZANOVA, M. A. **Influence of climatic and soil conditions on ascorbic acid content of plants.** *Vitamin Res. News* (U.S.S.R.) 1, 1946 (96-101). C.A. 42 (2376).
A review.

[1087] 631.411.4: 553.97
FRASER, G. K. **British peats.** *Agriculture* 55, 1948 (71-78). [Macaulay Inst. for Soil Res., Aberdeen]

In regions of high rainfall in the west, peat tends to form over wide areas which may not be badly drained, as are the south-eastern peat lands, but on which moorland vegetation produces a waterlogged surface. The same result arises on wet cold hills. If the nature of the vegetation changes, the peat may be raised above the source of plant nutrients and growth becomes impossible. The exposed peat then becomes eroded into channels. If the peat surface becomes reasonably dry, forest may develop on it.

Local deposits or basin peat, formed in badly drained places, are usually over 10 feet deep and show changes from one level to another. Regional deposits or blanket peat or hill peat are normally less than 10 feet deep and do not show marked changes at different levels.

Peatlands may be reclaimed by drainage, but over-drainage should be avoided as, once over-dried, peat is difficult to re-wet and, if fallow, it may suffer from wind erosion. One method of reclaiming moss peat is to remove almost all the peat for fuel and replace the turf on the surface where it is burnt or ploughed in. Lime and dung are applied. Where more than a foot of peat is left, sand,

clay or mineral soil is worked into the peaty, ploughed layer. If the underlying soil consists of bouldery, morainic drift, the land will not be suitable for agriculture, and should be forested.

631.41 SOIL CHEMISTRY

(See also Abs. Nos. 1139, 1159, 1196, 1202)

[1088] 631.411.4: 631.415.1: 541.134.5
FIRTION, F. **Sur les variations du pH et du rH dans quelques tourbières du Jura français. [On the variations of pH and rH in some peat bogs of the French Jura.]** *C.R.* 226, 1948 (827-829). [F.]

In three peat deposits the pH increased with depth down to a level which varied for each bog and appeared to be related to the mineral content. Below this level, variations in pH became irregular. The Pt-electrode potential, from which rH values were calculated, diminished with depth and eventually became negative. The change in sign occurred at the least depth in peat with the highest mineral content.

[1089] 631.411.4: 631.811
FILMAN, C. C.; TRUSCOTT, J. H. L.; GOODWIN-WILSON, R. **A 5,000-acre water garden?** *Better Crops* 32, 1948 (15-18, 46). [Dept. Hort. Agric. Coll., Guelph, Ont.]

Attempts to determine what fertilizers were needed for 5,000 acres of organic soils near Toronto were unsuccessful in that analyses were not reflected by the condition of the growing plants. The marsh soils contained few minerals, leaching was considerable and the crop was feeding on solutes in the top 8-12 inches of the soil. When soil samples were pressed and the

extracted liquid analysed, data showed that amounts of NPK in the solutes were related to the condition of plants growing in the marshes. Considerable quantities of solutes, particularly K, were removed from the marshes by drainage pumps.

[1090] 631.411.4 : 631.811
HILL, H.; CANNON, H. B. **Nutritional studies by means of tissue tests with potatoes grown on muck soil.** *Sci. Agric.* 28, 1948 (185-199). [Cent. Expt. Farm, Ottawa.]

K is the predominating fertilizer element affecting yield on these soils, and tissue analyses indicate that if plants contain <3500-4000 p.p.m. of K, yield will be depressed. K-deficiency symptoms appeared in plants with K levels of 2100 p.p.m. From the lowest level of P up to 70 p.p.m. there is no relationship with yield, but with levels above this there is a negative relationship if the K level is below 3000 p.p.m. If K in the tissue is above this figure there is no relationship between P and yield. Unless there is sufficient K available the application of P is likely to depress yield. There is probably a positive relationship with yield when levels of N are up to 200 p.p.m., but with levels of 200-1000 there is a negative relationship with yield. In most instances of high N and low yields, P is also high and K low. Effects of the higher N or P levels on yield are largely conditioned by the K content. A negative relationship exists between levels of K and Mg and of K and Ca. Low K is associated with accumulation in the plant of Mg and Ca.

[1091] 631.411.4 : 631.85
HIRVENSAALO, U. E. Koe nousevilla fosfaatimäärillä Suoviljelysyhdistyksen Leteensuon koeasemalla vuosina 1923-1946. [The importance of phosphate manuring of fen-peat soils as shown by experiments carried out between 1923 and 1926 at the Leteensuo experiment station.] *Finska MosskFören. Årsb.* 51, 1947 (42-50). [Fi.sw.]

The area was treated with 200 cubic metres of clay in 1932, since when annual dressings of 0, 20, 40 and 60 kg./ha. of P_2O_5 have been applied with basal dressings of 60-100 kg. of K_2O . Yields without fertilizer were small even on quite good fen-peat soils. K produced some, but not an economic, increase in yields, whereas K + 20 kg. of P_2O_5 caused

large increases. Larger doses of P caused relatively small further increases. This was generally true of all crops—oats, wheat, barley, fodder crops and hay. Hay and potatoes responded most to K alone.

[1092] 631.413.1 : 631.415.1
BOTTINI, E. **Buffer capacity of acid, neutral and alkaline soils and its causes.** *Ann. Ist. Sper. Chim. Agrar. Torino* 15A, 1941 (101-135). C.A. 42 (3115). [I.]

Buffer capacity was highest in alkaline soils of pH 7.3-7.8. In soils whose alkaline reaction is due to a $CaCO_3$ content of more than 15%, buffer capacity may be ascribed to the buffering system $H_2CO_3-Ca(HCO_3)_2$. There is no correlation between buffer capacity and colloidal matter in acid and neutral soils. For alkaline soils whose alkalinity is not due to high $CaCO_3$ content, a colloid content greater than 2.4% assures a good buffer capacity.

[1093] 631.414.323 : 631.414.04
BARBIER, G.; CHABANNES, J. Relation entre l'adsorption d'anions par les argiles et leur floculation. [Relation between the adsorption of anions by clays and their flocculation.] *C.R.* 226, 1948 (1036-1038). [F.]

Neutral flocculating salts were added to aqueous suspensions of clays treated with dilute solutions of PO_4''' or SO_4'' . Anion adsorption increased rapidly with increasing concentration of flocculating salt until flocculation was complete. With alkali cations of slight flocculating power, maximum adsorption only occurred at relatively high concentrations of flocculating salt. Clays from which exchangeable bases were removed by acid treatment for an hour adsorbed no PO_4''' , but a soil clay containing free Fe_2O_3 that had been in contact with dilute acid for several days instantly adsorbed PO_4''' in the absence of a flocculating electrolyte; this adsorption was favoured by the addition of $CaSO_4$. It was also established that a soil clay only adsorbs an electronegative silico-ferric hydrosol in the presence of a flocculating salt, a result which would explain why humic acid can be extracted easily only if the medium is capable of dispersing the clay.

[1094] 631.414.324 : 631.811
 ITALLIE, T. B. VAN. **Cation equilibria in plants in relation to the soil : II.** *Soil Sci.* 65, 1948 (393-416). [Agric. Expt. Sta. Inst. Soil Res., T.N.O. Groningen]

Ca, Mg, K and Na were added as carbonate to a sandy soil from which 90% of the exchangeable bases had been removed by percolation with 0.1 N. H_2SO_4 . The sum of the four cations added to 100 gm. of soil was 3.2 m.e. (S value), i.e., the amount present before treatment, or a multiple of S. N and P were also supplied. Other series of cultures were set up with and without cation addition, and oats were sown in all experiments. Growth varied more and plants showed a lower degree of cation saturation on treated soil than on the original soil, the greatest difference being in Ca uptake, due possibly to replacement of lost non-exchangeable Ca by part of the added Ca. This also held to a lesser degree for Mg. With 2S values, the pH, yields and Ca, Mg and K content of the plants rose; doubling the cation content of the original soil raised the Mg, K and Na and depressed the Ca content of the plants. Partial replacement of Ca by K and Na decreased Ca, Mg and Na and increased K contents, lowered yields and resulted in unhealthy plants. Similar effects were observed with 3S values. With small amounts of added Na and K, Na uptake was depressed by K, but became independent of K with large additions. High proportions of Ca increased the availability of all cations especially Na; addition of Ca alone to the acid-extracted soil resulted in small yellow plants with very high Ca and Na, normal Mg and very low K contents in spite of a large reserve of non-exchangeable K in the soil. The use of NH_4 instead of NO_3 nitrogen tended to induce symptoms of Ca and Mg deficiencies and resulted in higher K contents.

It is concluded that, except at low pH values, K uptake is proportional to the concentration of exchangeable K, but that the Na content is primarily dependent on K uptake. Ca uptake depends on the percentage of Ca in the total cations, and is depressed more by alkali ions than by Mg. Mg occupies a position intermediate between Ca and the alkali ions.

[1095] 631.415.1 : 631.414.3
 LITYŃSKI, T. ; ZIMNY, F. **Research on the determination of the "hydrolytic acidity"**

of the soil. *C.R.M. Acad. Polon. Sci. Let. (Cl. Sci. Math.)* No. 1-3, 1947 (10-11). [E.]

It is shown that Ca rather than Na acetate should be used in determining hydrolytic acidity, since the Ca salt has a much greater facility for displacing H ions from the soil complex. The facility of displacement varies with the soil : acetate ratio which should be 1 : 60 and not 1 : 5 or 1 : 2.5 as usually recommended. Using a ratio of 1 : 60 the entire quantity of replaceable H goes into solution in a single extraction. The following procedure is recommended : 10 gm. of air-dry soil is treated with 600 c.c. of N.Ca acetate and rotated in an end-over-end shaker for one hour. The solution is filtered, and 100 c.c. of the filtrate titrated electrometrically with 0.1 N. alkali to pH 7.8. The number of c.c. of alkali used multiplied by 6 gives the hydrolytic acidity per 10 gm. of soil.

[1096] 631.415.36
 IONESCU-SISEȘTI, G. **Contribuțiuni la cunoașterea și ameliorarea pământurilor sărăturoase din România.** [Contributions to the survey and amelioration of saline soils in Rumania.] *An. Inst. Cerc. Agron. Român.* 1946, 18, 1947 (3-30). [Rm.f.]

Experiments extending over 6 years in the Călmățiu valley indicate that the saline soils of this region can only be utilized as pastures of mediocre quality owing to their unfavourable texture and structure, the plasticity and impermeability of the upper horizon, high salinity, alkalinity and poor drainage. General recommendations for improvement cannot be made as these soils represent several types characterized by differences in chemical composition, depth and composition of ground water, microrelief, mechanical composition and plant associations. Soils carrying a *Kochia* association gave better yields than those with *Artemisia*, while Obionetum soils were completely incapable of supporting oats. Considerable increases in yield were given by fertilizing the Staticeum and Obionetum soils, but the effect was very slight in the case of the Glycerietum and Salicornietum unless preceded by irrigation. The transition soils of low salinity characterized by associations of *Statice*, *Poa bulbosa*, *Polygonum aviculare*, etc., should not be deeply ploughed as salinity increases with depth. Irrigation increased the yields on highly saline, but not on feebly saline soils,

and must be followed by the application of N and P to the upper horizons. CaSO_4 was not effective on the solonchak soils, but treatment with powdered lignin or stable manure gave good results. The most suitable crops for cultivation were those with shallow root systems, tolerance of alkalinity and the ability to provide a good cover, thereby preventing evaporation from the soil surface. Examples are beet and millet. Irrigation would allow the establishment of rice cultivation as in western Rumania, where this crop has given good results on saline soil.

[1097] 631.415.36
GREENE, H. **Using salty lands.** *F.A.O. Agric. Studies* 3, 1948, pp. 49.

An account is given of soil reclamation of salt lands in Egypt, Sudan, Gezira, North China, San Joaquin Valley, North India, U.S.S.R. and Hungary and of marine reclamation in New Zealand, Germany, Netherlands and Belgium. Problems of the removal of excessive salts and of the building up of a high content of exchangeable Ca are discussed.

[1098] 631.415.8
HARPER, H. J. **Crop adaptation to soils of varying acidity or alkalinity.** *Okla. Agric. Expt. Sta. Bull.* B-316, 1947, pp. 15.

The soil reactions most suitable for different field crops, fruits, vegetables, flowering plants, trees and shrubs are tabulated. Crops are also suggested for acid-tolerant rotations whose use is favoured in high-rainfall areas by the fact that loss of Ca from partially neutralized acid soil is low compared with the loss from a completely neutralized soil. Disadvantages of an acid-tolerant rotation include the gradual increase in acidity and reduced rate of biological activity in cool wet weather. Many bacteria including *Azotobacter*, cannot tolerate acid conditions although legume bacteria can survive in soils which are more acid than those which can be tolerated by the legumes themselves.

631.416 COMPOSITION OF SOILS (See also Abs. Nos. 1093, 1115, 1127, 1155)

[1099] 631.416:619
BEESON, K. C. **Soil deficiencies and nutritional troubles in animals.** *J. Soil Water Conserv.* 3, 1948 (61-68, 100). [U.S.D.A. Soil and Nutr. Lab., Ithaca, N.Y.]

Maps of U.S.A. show results of reconnaissance surveys of the occurrence of mineral nutritional diseases in animals and plants due to the lack of P, Co, Ca, Cu, I, Fe, Mg and Zn and excess of Se. These diseases are most common along the coastal plain, in the highly leached acid soils of the north and in the alkaline soils of the arid west. Deficiency is not always directly related to the fertility of the soil as shown in crop production. Different forage species may contain different concentrations of elements. Bluegrass may have 3 times as much Co and twice as much P as timothy grown under the same conditions. Clovers often contain 2-3 times as much Co as do grasses growing on the same soil.

Fertilizers should be used to widen the choice of crops to include those that will benefit animals through adequate supplies of mineral elements as well as through high feeding values. At present there is no method that will evaluate improvement in the nutritive value of plants as a result of the use of fertilizers.

[1100] 631.416:631.415.1
HARPER, H. J. **Soil reaction and availability of plant nutrients.** *Okla. Agric. Expt. Sta. Bull.* B-315, 1947, pp. 11.

The effect of soil reaction on the availability of plant nutrients was observed by examination of over 3000 soil samples. The easily-soluble-P content tended to be low in strongly acid soils and high in alkaline soils unless the latter were developed on non-acid parent material low in soluble P. Acid conditions reduced the activity of the soil micro-organisms which decompose organic matter to form NO_3^- and SO_4^{--} , and caused a decline in soluble Ca, Mg and K, but the amounts of these elements available for plant growth depended on the exchange capacity of the soil. Strongly acid sandy soils were usually deficient in available K, but the clay content was more important than degree of acidity in determining the quantity of replaceable K in medium- and fine-textured soils.

[1101] 631.416.1:631.417.2:631.58
MILLER, M. F. **Studies in soil nitrogen and organic matter maintenance.** *Missouri Agric. Expt. Sta. Res. Bull.* 409, 1947, pp. 32.

On a Missouri soil of medium fertility receiving moderate applications of P and lime, during 24 years the N and organic

matter changes were confined to the surface 7 inches. Increases in N content under different crops were 340 lb./acre with continuous red clover with hay removed; 440 lb. with continuous lucerne with crop removed; 520 lb. with continuous bluegrass sod and nothing removed; 600 lb. with continuous red clover and all crops turned under; 1080 lb. with continuous sweet clover and all crops turned under. A 3-year rotation of maize, wheat, clover maintained soil N at near the original level. Continuous rye turned under while green in May and the land left bare until September gave a N loss of 640 lb./acre during the 24 years. Continuous rye turned under while green and immediately followed by cowpeas turned under in autumn, gave a gain of 200 lb. in the 24 years. The total organic matter increased from 6200 lb. under continuous rye to 33700 lb. under continuous sweet clover. In general, the larger increases were under those crops where the N content also increased.

[1102] 631.416.2
PRINCE, A. L.; TOTH, S. J.; BEAR, F. E. **Phosphorus-supplying power of 20 New Jersey soils.** *Soil Sci.* 65, 1948 (297-308).

Lucerne was grown in pots receiving dolomitic limestone, K, B, Cu, Zn, Fe and Mn with (a) a P application equivalent to 200 lb./acre of P_2O_5 , (b) an application related to the known P-fixing capacity of the soils, and varying from 100-1600 lb. or (c) no applied P. The degree of yield increases with (a) and (b) indicated the soils most in need of P. There was no correlation between the total P_2O_5 content of the soils and the yields of lucerne without applied P. Of the soils of high P-fixing capacity, some required large P_2O_5 applications for maximum crop production, whereas others provided adequate supplies from the soil reserves. Sands of low P-fixing capacity required applied P for maximum yields. The P-Mg equivalent ratio of the lucerne samples averaged about 1.0 and showed no correlation with the P-fixing capacities of the soils.

[1103] 631.416.2 : 631.414.324
BARBIER, G.; CHABANNES, J. **Rôle des cations échangeables dans l'adsorption d'anions par les argiles.** [Function of

exchangeable cations in the adsorption of anions by clays.] *C.R.* 226, 1948 (749-751). [F.]

Kaolinite did not fix PO_4''' if the pH of the medium was below 3. As the pH value was raised by the addition of CaO, thereby resulting in an accumulation of Ca on the clay, an increasing quantity of PO_4''' was fixed, an effect which was the reverse of that shown by $Fe(OH)_3$ or $Al(OH)_3$. The addition of monovalent bases to acid kaolinite had an effect similar to that of CaO up to pH 6.2 above which PO_4''' adsorption decreased rapidly. Increase in pH value may either promote anion adsorption by causing attractive cations to accumulate on the clay, or impede anion adsorption by raising the concentration of OH' which tend to replace other anions adsorbed on the clay. The predominating effect depends on the pH and the nature of the exchangeable cations. Montmorillonite gave the same qualitative results as kaolinite, but only retained half as much PO_4''' .

The presence of exchangeable cations was not essential for the adsorption of SO_4'' which seemed to be capable of direct adsorption on the lattice. Adsorption decreased as the pH rose to 11, after which it increased considerably. Adsorption of anions in conjunction with exchangeable cations was not shown by electronegative colloids such as silica gel or Ca humate, which did not adsorb PO_4''' or SO_4'' from unsaturated solutions whatever the pH.

[1104] 631.416.2 : 631.821.1
MITSCHERLICH, E. A. **Versuche über die Festlegung der Phosphorsäure durch Gaben von Kohlensäurem Kalk.** [Experiments on the fixation of phosphoric acid by applications of calcium carbonate.] *Ztschr. Pflanz. Düng.* 39, 1947 (1-9). [G.]

Pot experiments with oats and red clover in a soil requiring P showed that, with a chalk dressing of 1.5 gm. per pot, yields were largest where the P was given in fractions over the growing season, whereas with a 15-gm. dressing (a) the yields were highest when the P was given in one early application, and (b) P fixation appeared to be slightly decreased. The higher soil temperature induced by blackening the pots reduced fixation with the 1.5-gm. and increased it with the 15-gm. application. The effect of

chalk at 1.5gm. per pot on P fixation in sand cultures was studied, using different levels of Ca, Fe and Al phosphates. The yield curves were all more or less S-shaped. Red clover and rye grass responded with considerable yield increases only to the higher P applications, whereas oats and soya responded well to even the smallest applications. This is attributed to the effect of the wide variation in the kind and amount of nutrient substances provided by the different plants themselves in their endosperms at sowing.

[1105] 631.416.316 : 631.85
MACINTIRE, W. H.; SHAW, W. M.;
ROBINSON, B. ET AL. **Disparity in the leachability of fluorine from incorporations in phosphated and slagged soils.** *Soil Sci.* 65, 1948 (321-339). [Tenn. Agric. Expt. Sta.]

The leaching of F from (a) a silt loam of pH 5.6 initially treated with 1280 lb./acre of P_2O_5 as various phosphates and then with 2400 lb. of F as CaF_2 spread over 10 years, was compared with that in 6 years from (b) loams treated initially or over the period with up to 20 tons/acre of Ca-silicate slag providing a total of 1280 lb./acre of F, and containing 1.5% of P_2O_5 .

The rate of loss of F from (b) due to a 51-inch rainfall was 23 times that from (a), apparently due to a decrease in the F-retaining power of the alumino soil complexes that resulted from the disintegration of the glassy material. The drainage water from (a) attained F concentrations of about 2 p.p.m. (0.15 p.p.m. with rock phosphate). Moderate limestone and dolomite applications slightly increased F losses from rock and tricalcium phosphate incorporations but not from dicalcium or metaphosphate. In the drainage from (b), the highest concentration of F was 40 p.p.m. and occurred in the second year after incorporation of 20 tons of slag. The concentrations diminished by 80% during 6 years' gravitational passage through a corresponding placement of unslagged soil, and it is considered that no harmful concentration of F could develop in the ground water through the use of slag or phosphatic fertilizers.

[1106] 631.416.7 : 632.191
VLAMIS, J.; JENNY, H. **Calcium deficiency in serpentine soils as revealed by ad-**

sorbent technique. *Science* 107, 1948 (549). [Univ. Calif., Berkeley]

Conejo soil derived from outwash material of a serpentine rock area is deep, of pH 7.2 at the surface, and rich in clay which contains 5.5 m.eq. of exchangeable Ca/100gm. of soil. Lettuce plants grown in the soil responded to N, P and K, but after 2-4 weeks the plants developed rosette disease which responded to gypsum and lime. Amberlites saturated with Ca, Mg, Sr and K were added to fertilized Conejo soil and to a productive Yolo soil. Ca-amberlite in Conejo soil overcame the disease and produced normal plants. In Yolo soil it did not retard the excellent growth of the plants. Mg-amberlite and K-amberlite produced characteristic rosette-disease symptoms in Yolo soil and enhanced the extent of the disease in Conejo soil. This rules out Mg as the primary factor and suggests that the degree of saturation of exchangeable Ca is a prime contributing factor in the origin of lettuce rosette. Sr-amberlite did not produce the disease in Yolo soil and did not appreciably reduce it in Conejo soil.

[1107] 631.416.835
BERTRAND, G.; BERTRAND, D. **Sur la présence et le dosage du rubidium dans les terres arables. [On the presence and estimation of rubidium in arable soils.]** *Ann. Agron.* 18, 1948 (1-3). [F.]

Samples of soil were analysed for Rb by heating to destroy organic matter and to dehydrate the clay, treating with 0.1 n. and 10 n. HCl, evaporating and heating with concentrated HCl. The filtrate was evaporated and analysed spectrographically. The amounts of Rb present ranged from 0.2 mg. to 18.7 mg. per kg. of oven-dried soil, but cultivated soils usually contained 1-5 mg. per kg. The K, Na and Rb contents of 21 samples from France, Denmark, Italy, Serbia and the banks of the Nile and Niger are listed.

[1108] 631.416.871.1
MATTSON, S.; ERIKSSON, E.; VAHTRAS, K. **Effects of excessive liming on leached, acid soils. II. Forms of manganese.** *LantbruHögsk. Ann.* 15, 1948 (291-307). [E.] [Inst. Pedology, Uppsala]

The distribution of total Mn, acid-oxalate-soluble Mn, exchangeable Mn, hydroquinone-

reducible Mn and pyrophosphate-soluble Mn in an unlimed podzol were compared with those in a limed adjacent field.

Mn deficiency has been found to be related to the amount of exchangeable (divalent) Mn and to the amount of easily reducible Mn, but other factors control the supply of Mn to plants. One such probable factor is the presence in soil of soluble Mn in the form of complex ions, such as the citrate ion, which might be formed from a number of anions produced in the soil or exuded by plants. The pyrophosphate ion forms soluble complexes with Fe, Cu, Co and Zn as well as with Mn. The salts formed from these ions are normally highly insoluble in soil of high pH, and the use of a soluble pyrophosphate as a solvent for these elements in the soil would dispense with the application of large amounts of salts to soils already containing an ample supply of these elements.

[1109] 631.416.873 : 619
POPE, A. L. ; PHILLIPS, P. H. ; BOHSTEDT, G.
Effect of cobalt on growth and certain blood constituents of sheep. *J. Animal Sci.* 6, 1947 (334-342). B.A. AIII, 1948 (148).

The loss of appetite, emaciation and anaemia shown by sheep grazing in Co-deficient pasture and by those fed on hay from the affected area were alleviated by the addition of 1 oz. of CoSO_4 to 100 lb. of salt (fed free choice).

631.417 ORGANIC MATTER

(See also Abs. Nos. 1155, 1171)

[1110] 631.417 : 631.461.1/3
KHAN, D. V. [Soil organic matter.] *Sovet. Agron.* 5, No. 7, 1947 (60-64). C.A. 42 (3113).

400 gm. of soil consisting of sand and clay in the ratio of 7 : 3 were placed in pots; 4 gm. of C in the form of cellulose, starch, lignin or glucose was added for every 100 gm. of soil which was then inoculated with an infusion of a chernozem soil and incubated at 15-25°. After 11 months, C determinations showed that the highest C content was in the lignin culture and the lowest in the glucose culture. The humic acid was extracted, and its composition compared with that extracted

from the different zonal soil types and a few organic-matter mixtures. It is concluded that in the decomposition of starch, cellulose, glucose and lignin an organic substance resembling humic acid is formed.

[1111] 631.417.2 : 631.414.2
VLADYCHENSKY, S. A. [Colloidochemical properties of soil organic matter]. *Dokl. Akad. S.-Kh. Nauk* 12, No. 8, 1947 (29-33). C.A. 42 (3114).

Four organic-matter fractions were isolated by the Tiulin method from a solodized chernozem, and the sols were coagulated with CaCl_2 with and without drying and with sols of $\text{Fe}(\text{OH})_3$ with and without drying. Gels obtained by coagulation with Ca ions were capable of a secondary peptization. On exchanging the Ca with Na, all the gels went into solution, but on drying at 105° for 15 days, only 42% went into solution. The precipitates obtained by the mutual coagulation of $\text{Fe}(\text{OH})_3$ gels with humus were the least mobile.

One portion of organic matter is colloiddally dispersed and water-soluble; the second becomes soluble after treatment with NaCl and represents the fraction of free organic matter that can be coagulated by bivalent cations; the third represents aged humates of Ca and R_2O_3 and can be separated only by treating the soil with alkali; the fourth becomes soluble in alkali only after HCl treatment and represents a group of aged humates associated with Fe and Al.

[1112] 631.417.2 : 631.811.2
KHRISTEVA, L. A. [The influence of humic acid on the growth of plants with various ratios of nutrients during their early development.] *Dokl. Akad. S.-Kh. Nauk* 12, No. 10, 1947 (23-29). C.A. 42 (3515).

Tomatoes, wheat and cowpeas were grown in sand supplied with N, P and 1% solutions of Na humate extracted from weathered coal shale. The humate favourably affected P intake in the early stages of plant growth. The increase of P soluble in trichloroacetic acid in the early stages of growth led to an increase in the processes of oxidation-reduction.

[1113] 631.417.745.4 : 576.809.7
GROSSBARD, E. Production of an antibiotic substance on wheat straw and other organic materials and in the soil. *Nature* 161, 1948 (614-615). [Expt. Res. Sta., Cheshunt]

Certain micro-organisms known to produce antibiotic substances on synthetic media will do so when grown on autoclaved wheat straw to which water is added. *Penicillium patulum* grew well on sterilized soil, but aqueous soil extracts did not inhibit the growth of test bacteria. When the fungus was grown on sterilized wheat straw, bracken and sugar-beet waste, an antibiotic substance was formed. Addition of 3.5% by weight of glucose increased the inhibitory action of the straw and bracken cultures. Fresh wheat straw (5% by weight) and water (50% by weight) were mixed with oven-dried soil, autoclaved and inoculated with *P. patulum*. The liquid expressed from the soil inhibited the growth of test organisms and addition of glucose greatly increased the inhibitory action.

It appears that carbohydrate decomposition is essential for the production of an antibiotic substance in sterilized soil by *P. patulum*. Apart from altering the microflora, glucose may induce the production of an antibiotic substance in soil not only from *P. patulum*, but also from other micro-organisms.

631.42 TECHNIQUE AND ANALYSIS

(See also Abs. Nos. 1090, 1137, 1299, 1309)

[1114] 631.42 : 631.432.2
SHAW, E. A new soil moisturizing technique. *Soil Sci.* 65, 1948 (347-348). [Univ. Ariz.]

The desired amount of soil of known initial moisture content and uniformly mixed is passed through a 2 mm. screen and spread on paper in a deep-freeze room. While it is cooling, snow or ice scorings to the desired moisture content are passed through a 1 mm. screen and the snow-soil mixture rolled until as uniform as possible. The soil is ready for use on warming to room temperature. Transport after thawing may cause puddling. Soils have been prepared in an unpuddled, stable and very uniform condition with moisture level varying from air-dry to a level higher than the moisture equivalent.

[1115] 631.42 : 631.547.2 : 631.416.8
REED, H. S.; DUFRENOY, J. Regression curves of plant growth on the levels of an essential micro-nutrient. *Soil Sci.* 65, 1948 (291-295). [Univ. Calif.]

Data from experiments on the relationship between Zn concentration and pea growth from seed (roots, tops, pods and seeds separately) and of B on the growth of sunflower and radish are presented to illustrate the method used for relating the concentration of a substrate to the response. The actual yields for all the dosage levels from nil upwards are added together, giving the sum of the cumulated yields, which is taken as 100%. Each successive cumulated yield in the series is expressed as a percentage of this sum. These cumulated percentages, plotted as abscissae on the normal probability scale against the logs of the concentrations, yield a straight line for "log-normal" distributions.

With peas, the regression lines for tops and roots were very similar. Their gradients were much greater than those for pods and seeds, reflecting the prior requirements of the vegetative system and indicating the threshold level for seed production. The method might be useful in studying the effect of the anions and cations of auxins on plant growth.

[1116] 631.421
OLIVEIRA, A. J. DE. Ensaios de uniformidade. Estudo preliminar com *Lupinus luteus* L., em Sacavém. [Uniformity trials. A preliminary study with *Lupinus luteus* L. at Sacavém.] *Agron. Lusit.* 7, 1945 (207-244). [Pt.e.]

A general discussion of uniformity trials is followed by a study of the size and shape of plots in relation to field experiments, the analysis of variance and covariance being applied to yield and stand. Experimental errors, expressed as percentages of the mean, decreased with increased size of plot, as did efficiency in the use of land when the entire plot was harvested. The 1-row plots 5-10 m. long were the most efficient. Discrepancies in the results are attributed mainly to the rapid dehiscence of the crop.

[1117] 631.423 : 544.6
OERTEL, A. C. A note on background correction in spectrochemical analysis. *Aust. J. Coun. Sci. Indust. Res.* 20, 1947 (157-161).

The density-log relative exposure curves as obtained with a rotating stepped-sector wedge and a Process plate have the same general shape and the same gamma for monochromatic (line) radiation and continuous radiation (at the same wavelength) at least up to a density of 0.85, but the curve for line plus background has a different shape and gamma at high densities from those of the curve for line alone. It is suggested that the differences are caused by a distortion of the relative exposure scale due to the background radiation being photographically effective only in the steps of large aperture. The best method of correction found so far is to subtract a certain fraction of the background density from the line + background density, this fraction being the ratio of the slopes of the upper straight part of the line+background curve and the straight part of the background curve.

[1118] 631.423.3 : 631.416.313
STEUTEL, H. E. **Nephelometric determination of chlorine with calomel.** *Meded. Alg. Proefsta. Landbouw* 66, 1948, pp. 11. [E.]

To 100 cc. of water or soil extract, 10 cc. of 15% HNO_3 and 3 cc. of 5% gum arabic are added. The Cl present is precipitated as calomel by the addition of about 0.1 gm. of fine-grained mercurous sulphate followed by shaking for 30 seconds. Using Fisher's electric colorimeter, turbidities > 80 and < 45 (as defined by the position of the sliding contact on the scale) must be avoided, the soil extract being respectively diluted or evaporated and then re-examined. A 1-cm. cuvette was satisfactory in nearly all cases. A standard curve was obtained using 1-10 cc. of 0.01 mol. KCl, with HNO_3 and gum arabic, the whole being made up to 100 cc. with 0.1 N. $\text{Ca}(\text{NO}_3)_2$.

[1119] 631.423.3 : 631.416.322
WISAKSONO WIRJODIHARDJO, M. **Nephelometric determination of sulphate.** *Meded. Alg. Proefsta. Landbouw* 65, 1948, pp. 12. [E.]

The sulphate in 100 cc. of soil extract or river water is precipitated with BaCl_2 crystals of size 0.4-0.5 mm. after 0.5 cc. of 10% HCl and 10% of 4% glycerol have been added. After 30 minutes the light absorption due to the turbidity produced is determined by the Lange light colorimeter. By the use of a verification graph, constructed beforehand from data given by known concen-

trations of K_2SO_4 , the amount of SO_3 present can be determined. The results agree with those obtained gravimetrically. The presence of Cl caused no inaccuracy. Nitrates in large amounts interfered with the results, but the amount of nitrate in soils and river water is never sufficient to cause inaccuracy. Any darkness of the original solution due to organic matter must first be removed by oxidizing with H_2O_2 . If the dark colour is due to Fe compounds and does not disappear after treatment with H_2O_2 , the difference between the colorimeter deviations before and after adding BaCl_2 is taken as the deviation due to SO_3 . 100 samples can be analysed daily.

[1120] 631.423.3 : 631.416.4
TINSLEY, J. **The micro-determination of potassium as cobaltinitrite in biological and agricultural materials. Part 1. Review.** *Analyst* 73, 1948 (86-95). [Univ. Reading]

The subject is reviewed, with 87 references, under the headings:—reagent; precipitation; washing the precipitate; estimation of the precipitate volumetrically, colorimetrically, gasometrically and electrolytically; interference; sensitivity and accuracy; other methods, including sedimentation and turbimetric procedures.

[1121] 631.423.3 : 631.416.847
LUNDEGÅRDH, P. H. **Some aspects of the determination and distribution of zinc.** *LantbrHögsk. Ann.* 15, 1948 (1-36). [E.] [Inst. Pl. Phys. Uppsala]

A review of analytical methods and the determination of Zn in crystalline rocks and in sediments and sedimentary rocks.

[1122] 631.423.3 : 631.811.4
KORNILOV, M. F. **Comparative evaluation of several methods of determining the lime requirement of soils.** *Dokl. Akad. S.-Kh. Nauk* 12, No. 7, 1947 (3-9). C.A. 42 (3513).

In the Lazarev method, which gives results nearest those of field experiments, the lime requirement is $N_1 - [2(N - N_1)/3]$ 0.123 where N is the total, and N_1 the humic, N of the alkali extract; 0.123 is the factor accounting for the lime needed to neutralize the humic acids which retain N . The methods next in accuracy are those of Kappen and of Galkovsky.

[1123] 631.423.5 : 631.437.31
FISCHER, C. W. **Soil conductivity tests.** *N.Y.St. Flower Grow. Bull.* 31, 1948 (7). C.A. 42 (3114).

Soil conductivity readings are an indication of the amount of soluble salts present in the soil. The soil is allowed to stand in contact with distilled water for 20 minutes, and the solution is then poured off and the conductivity measured. Satisfactory results are obtained by using a ratio of 1 part of soil to 2 parts by weight of water or 1 part of soil to 5 parts of water. Conductivity is increased by soil sterilization because of salt release, and by poor drainage or insufficient water, with heavy fertilizer applications.

[1124] 631.425.4
BRYANT, J. C. ; BENDIXEN, T. W. ; SLATER, C. S. **Measurement of the water-stability of soils.** *Soil Sci.* 65, 1948 (341-345). [U.S.D.A.]

The soil sample was crushed and sieved to separate the 5-3-mm. fraction which was then immersed until thoroughly wet and wet-sieved for 2 minutes. Any gravel was separated out and the soil retained on the sieves was dried at 105°C. Water stability was calculated as the percentage of the sample retained. The standard deviation between duplicates for the total data for 26 samples was 1.2%, and the data show an improved replicability over typical aggregate analyses such as those by the Yoder method. The significance of the results from different procedures for examining structural properties is discussed in view of the work of Russell and Feng who showed that water stability may be characterized by an initial stability to wetting, and a secondary stability or rate of disintegration on continued washing. Consideration of the initial stability is most important where information is wanted on the water stability of the entire structure of a tilled soil, as that affects resistance to slumping and puddling.

[1125] 631.427.3
CHUBB, W. O. ; ATKINSON, H. J. **Plant tissue testing. II. A study of the method of foliar diagnosis.** *Sci. Agric.* 28, 1948 (49-60). [Sci. Serv. Ottawa]

The foliar-diagnosis method was investigated using tomatoes, potatoes, oats and maize grown on two soils of different fertility levels and under various fertilizer treatments.

There was no direct relationship between the composition of the leaves and the addition of fertilizers to the soils, nor between yields and either the intensity of nutrition values ($\%N + \%P_2O_5 + \%K_2O$) or leaf content of N, P or K. The distribution of NPK units on a trilinear graph showed no simple relationship to the yields obtained.

[1126] 631.427.3 : 631.415.1
WALLACE, T. ; DAVIES, W. M. ; NICHOLAS, D. J. D., ET AL. **Some effects of lime and fertilizers on potatoes on a strongly acid soil as determined by visual symptoms and chemical tests.** *Long Ashton Res. Sta. Rept.* 1946, 1947 (61-66). *Hort. Abs.* 17 (274).

The mineral status of plants was well shown by visual symptoms and by full chemical analysis and tissue tests, and the results by the three methods showed good agreement. A combination of the three methods may be valuable in examining problems of crop production on acid soils.

[1127] 631.427.3 : 631.416.847
ROBINSON, W. O. ; LAKIN, H. W. ; REICHEN, L. E. **Zinc content of plants on the Friedensville zinc-slime ponds in relation to biogeochemical prospecting.** *Econ. Geol.* 42, 1947 (572-581). *B.A.A.I.* 1948 (36).

Zn contents ranging from 39 to 5400 p.p.m. were found in ground samples of plants on slime ponds. Indications of probable Zn deposits in limestone residual soils may be revealed by analysis of poplar leaves on wooded and uncultivated areas, and of ragweed in non-wooded and cultivated areas, respectively.

[1128] 631.427.3 : 631.81
ATKINSON, H. J. ; PATRY, L. M. ; LEVICK, R. **Plant tissue testing. III. Effect of fertilizer applications.** *Sci. Agric.* 28, 1948 (223-228). [Div. Chem., Sci. Serv. Ottawa]

Studies of the use of plant tissue tests show some relationship between crop yields and tissue tests for nitrates, but no satisfactory relationship was found between crop yields and tissue tests for P and K. In fresh potato stems the concentration of nitrates and K usually decreased during the season, but trends in P concentration were not so definite. Increasing amounts of N and K in the fertilizer increased the concentration of these

nutrients, but increasing amounts of P applied to the soil did not always affect plant phosphates. Frequently when N concentration was increased, P concentration decreased. Plants grown with the same fertilizer treatment on different areas could have approximately the same concentration of N, P and K in their tissues, but the yield from one area could be double that from the other.

[1129] 631.427.4
SANCHEZ MARROQUIN, A.; TAMAYO, R. *Aspergillus niger* como indice del contenido en potasio y fosforo de los suelos. [*Aspergillus niger* as an index of the potassium and phosphorus content of soils.] *An. Esc. Nac. Cienc. Biol.* 4, 1946 (199-212). [Sp.e.]

K and P content of 55 varied soil samples were investigated with (a) Mehlich's modification of the Niklas method using *Aspergillus niger*, and the results were compared with those obtained by the azotobacter soil-plaque method of (b) Halversen and Hoge and (c) Sackett and Stewart and by (d) Morgan's rapid chemical method. For K, all the methods gave rather similar results. For P, deficiencies were indicated in about 22 samples by (a) and (d) and in about 37 by (b) and (c). Method (a) is considered to be the most satisfactory for determining K and P deficiency in soils.

631.43 SOIL PHYSICS

(See also Abs. No. 1114)

[1130] 631.432.2 : 581.032.3
LANE, R. D.; MCCOMB, A. L. **Wilting and soil moisture depletion by tree seedlings and grass.** *J. Forestry* 46, 1948 (344-349).

The relative rates of moisture absorption and the soil-moisture percentages at permanent wilting were studied for brome grass, black locust, green ash and tomatoes grown in loam and sandy loam in pots. Both the rates and the percentages appeared to be correlated with the dry weight of roots. Brome grass, with the largest root weight, extracted most moisture and had the lowest wilting percentage; tomato extracted least and had the highest wilting percentage; the tree species were intermediate. In rich prairie soils, where grass roots ramify greatly, soil moisture is rapidly depleted during drought and the wilting percentage may be reached for seedling trees before their

roots have extended into the deeper soil layers. Moisture-conserving measures such as scalping and furrowing may prevent failure of the tree seedlings in the initial growing season.

[1131] 631.432.2 : 631.547.2
MILLER, E. H. **Growth and environmental conditions in Southern California chaparral.** *Amer. Midl. Nat.* 37, 1947 (379-420). *Biol. Abs.* 21 (2365). [Univ. S. Calif., Los Angeles]

Air temperature, soil temperature, evaporation rates, soil moisture and growth of common shrubs were measured between December 1935 and August 1938 at stations on northern and southern slopes at heights of 1500-5500 feet. The effect of altitude on rates of evaporation was slight, but slope exposure had a marked effect. Available soil moisture seemed to be the controlling factor in determining the beginning of growth in spring.

[1132] 631.432.2 : 631.557
MITSCHERLICH, E. A. Über den Einfluss des Wassers auf die Höhe der Pflanzenerträge. [**The effect of water on plant yields.**] *Ztschr. Pflanz. Düng.* 38, 1947 (202-215). [G.]

The effect of added water on the dry-matter yields of pot plants was studied under various conditions of application. When the soils used had received a complete fertilizer and were kept at full water capacity, then in the equation $\log(A-y) = \log A - cx$, in which y is the yield from x mm. of water, A is the theoretical maximum yield and c represents the yield-producing effect of a given quantity of added water, c was constant at 0.0128 and independent of the type of plant or soil. When the soils were previously soaked with a complete nutrient solution, the "effect factor" became 0.020, that is, the dry-matter-producing effect of unit quantity of water was greater, the greater the quantity of already-dissolved nutrient present. With soils moistened to less than full water capacity the effectiveness of a given amount of added water was less. When soils were moistened to capacity at definite intervals throughout the growing season, the total added water required to produce unit amount of dry matter varied directly with the length of the intervals. With oats, lupins, potatoes and maize, the amount of water required to produce 1 kg. of dry matter always varied inversely with the dry-matter yield of the crop.

[1133] 631.432.2 : 631.557
HAYNES, J. L. **The effect of availability of soil moisture upon vegetative growth and water use in corn.** *J. Amer. Soc. Agron.* 40, 1948 (385-395).

A soil with a smooth desorption curve was used in these greenhouse pot experiments. The treatments were (a) no irrigation after the initial water: harvest at permanent wilting, (b) small parts of the root system sparingly irrigated to cause temporary wilting on bright days, (c) irrigation to field capacity whenever the soil moisture became depleted to near the permanent wilting percentage, (d) irrigation to field capacity when soil-moisture tension dropped to 20 inches of mercury and (e) sub-irrigation from a permanent water table 6 inches below the soil surface.

The main conclusions were: the degree of availability of soil moisture, expressed as soil-moisture tension, markedly affected the growth of the test plant within the range from near saturation to near the permanent wilting percentage, but did not affect the amount of water transpired per unit of dry weight produced within that range. Plants which suffered daily recurrent temporary wilting transpired less water per unit of dry weight produced, but under humid climatic conditions the amount of vegetative growth made by these plants was small.

[1134] 631.432.2 : 634.9
BURRAGE, C. H. **A note on soil moisture and underground storage.** *Trans. Amer. Geophys. Un.* 29, 1948 (233-234). [T.V.A., Norris, Tenn.]

At moderate depth in the latter part of the growing season, soil moisture is less in forest than in the open. Two stations were established, 100 feet apart, on silty clay loam underlain by limestone. One was in natural forest of short-leaf pine, 35 years old, growing on abandoned, severely eroded land; the other was on open, more eroded land. Gypsum blocks were buried at 6, 12 and 18 inches and soil moisture was measured by the Bouyoucos method. Ground-water wells were made to a depth of 4 feet to measure soil water after field capacity was reached. At a depth of 6 inches in the open, moisture fluctuated with precipitation, and most of the moisture was removed quickly by evaporation. At this depth in the forest,

moisture was always greater and fluctuations less marked. Both forest litter and shade of the canopy reduced evaporation. At a depth of 18 inches, moisture changed little in the open and the amount was high throughout the growing season. In the forest, soil moisture became less during the growing season and fluctuated with the precipitation. Even moderate rainfall caused the appearance of water in the ground-water well in the open, but a storm of 5 inches of rainfall did not give water in the forest well.

[1135] 631.432.2 : 634.975
WILM, H. G. **Soil moisture under a coniferous forest.** *Trans. Amer. Geophys. Un.* Pt. III, 1943 (11-13). For. Abs. 9 (281). [Rocky Mountain For. Range Expt. Sta.]

Soil moisture was strongly affected by cutting treatments, the greatest deficiencies occurring on the uncut plots and the smallest on the clear-cut areas. It is suggested that these results are due to rainfall interception rather than variations in the sum of transpiration and evaporation.

[1136] 631.432.3 : 631.67
REITEMEIER, R. F.; CHRISTIANSEN, J. E.; MOORE, R. E., ET AL. **Effect of gypsum, organic matter, and drying on infiltration of a sodium water into a fine sandy loam.** *U.S.D.A. Tech. Bull.* 937, 1948, pp. 36.

Water penetration was improved on a highly stratified, impervious, fine sandy loam with high water-holding capacity by (1) adding powdered gypsum, (2) adding chopped lucerne and (3) prolonged drying of the soil to wilting range. Addition of gypsum and lucerne approximately doubled the infiltration rate with each irrigation, but the depth of penetration was not sufficient until the quantity of water applied was increased considerably. The irrigation water used had a low salt content, but a high proportion of Na salts. When the soil was allowed to dry to wilting point by withholding irrigation water, subsequent infiltration rates were increased even more than by the gypsum and lucerne treatments.

Both surface and subsoil were dispersed, the former from a deficiency of soluble cations, the latter from a high proportion of Na in the soluble salts. Gypsum flocculated the colloids in the surface soil, and removal of the added gypsum by leaching

restored the dispersed condition. In the subsoil, which was less permeable, the replacement of Na by the Ca of the gypsum and subsequent accumulation of Na salts may be injurious to plant growth unless they are leached below the root zone. Any attempt to improve infiltration must include the application of sufficient water for this purpose. Drying the soil to wilting range improves soil structure temporarily, provided plants are not injured by prolonged drought. Any soil treatment may have to be repeated periodically.

[1137] 631.432.4
PAIVA NETO, J. E. DE; DE JORGE, W.
Estudo preliminar do sistema água-solo-planta no Estado de São Paulo. [Preliminary study of the water-soil-plant complex in the State of São Paulo.] *Bragantia* 7, 1948 (133-149). [Pt.e.]

A discussion of soil-physical studies. For the major soil types of São Paulo a correlation exists between the wilting point and the moisture equivalent, and the wilting point may be rapidly obtained by multiplying the moisture equivalent by 0.68. The formulae of Vageler and Alten for computing hygroscopicity by means of exchange ions were inadequate. Different periods of exposure of soils to temperatures of 105-110°C. before determinations were made did not markedly influence the hygroscopicity. The highest values for water-holding capacity were obtained in the *terra roxa legítima* and the lowest in the Botucatu sandstone soils.

[1138] 631.434
DUTT, A. K. Certain aspects of the mechanism of aggregate stability in water. *Soil Sci.* 65, 1948 (383-392). [Cornell Univ.]

1-gm. samples of soil were shaken with water, ethyl alcohol, acetaldehyde, acetone, benzene and ether. Except with water, which produced turbidity for all samples, aggregates were stable for nearly every soil irrespective of the differences in dipole moments or dielectric constants of the liquids. Soaking in ether or alcohol for 24 hours mostly increased aggregate stability, but pretreatment with acetone lowered it, suggesting an inverse relationship between aggregate stability and the dipole moment of water-soluble liquids. Organic matter

appeared to have some protective action due possibly to the presence of fairly strong linkages in the organic exchange complex allowing combination with organic compounds. Except for one soil with a very low organic-matter content, Soxhlet extraction with 95% alcohol for 24 hours followed by resieving markedly increased aggregate stability. Dehydration by heat and alcohol may have effected intimate orientation resulting in increased resistance of the aggregates to disintegration. Aggregate stability was also increased by wet-sieving in solutions of Aerosol OT (dioctyl Na sulphosuccinate); this effect may be due to the slower capillary movement of water into the soil interstices thereby lessening the destructive action of entrapped air. When water-alcohol mixtures were used for wet-sieving, however, the surface-tension effect was dominated by the solvating power, as the alcohol concentration at which maximum aggregation occurred was a function of the organic-matter content. Lowering of surface tension by thermal energy decreased aggregate stability.

[1139] 631.434:631.414.2
DUTT, A. K. Mechanism of aggregation of clay minerals by soluble silicates. *Soil Sci.* 65, 1948 (309-319). [Cornell Univ.]

Kaolin was treated with K_2SiO_3 in concentrations up to 10% (percentage of K_2SiO_3 in air-dry clay) and bentonite with concentrations up to 47%; also both were treated with ethyl silicate. Aggregation increased for kaolin and decreased for bentonite with increasing concentrations of K_2SiO_3 . At 33% K_2SiO_3 , aggregation of bentonite again increased, but remained less than that of the water-treated control. Swelling of bentonite became almost negligible at 33%. Except at the 1% concentration, the dispersion of kaolin was unaffected by K_2SiO_3 but that of bentonite at 33 and 47% was 10.8 and 8.6% respectively compared with 49.3% for the control. The aggregation of ethyl silicate-treated kaolin was 96.5% as against 12.1% for the alcohol-treated control whereas bentonite showed a decrease in aggregation and dispersion with ethyl silicate. The curve obtained in the thermal analysis of the kaolin-10% K_2SiO_3 system differed little from that of pure kaolin, but the endothermic reactions of bentonite between 600 and 700°C. and between 700 and 900°C. tended to dis-

appear with increasing K_2SiO_3 concentration. This suppression and the absence of the K_2SiO_3 reactions in the system suggest the occurrence of a chemical reaction, possibly the hydrolysis of K_2SiO_3 . This hypothesis is supported by the similarity between the curves of the bentonite-47% K_2SiO_3 and bentonite-16% KOH systems. The thermal curve of the bentonite-ethyl-silicate system was similar to that of pure bentonite. An intense endothermic reaction at 130°C. that was probably due to SiO_2 was shown by the kaolin-ethyl-silicate curve.

It is suggested that kaolin strongly adsorbs silicates which, once dehydrated, become irreversible and cement the particles into stable aggregates, but the relatively high, evenly distributed negative charge of bentonite tends to retard silicate adsorption. The high-swelling nature of bentonite may also tend to disrupt any aggregates formed. It is concluded that it is the silica fraction which is concerned in stable-aggregate formation, this depending on the nature of the silicates as well as on the nature of the surface of the clay minerals.

[1140] 631.434 : 631.51
DUTT, A. K. **Puddling and other treatments in relation to soil structure and crop growth.** *J. Amer. Soc. Agron.* 40, 1948 (324-330).

The following treatments were applied to a silt loam which had been cultivated almost continuously for 10 years: (1) fallow, not puddled, (2) puddled by moistening and hoeing to 0-0.5-inch depth and fallow, (3) puddled and wheat straw incorporated into the wet soil surface at 2.5 tons/acre, (4) puddled and seeded with rye and vetch when the soil was dry, (5) not puddled and seeded to rye, (6) not puddled and seeded to rye and vetch, (7) maximum tillage. (2) and (7) did not affect aggregation, but (3) and (4) showed slight increase in aggregation. There was no relationship between aggregate stability and moisture content at the time of sampling. Puddling resulted in significant increase in volume weight.

Puddling reduced yield of rye and vetch by 50% and retarded root development. After a year the land was disced, limed and fertilized, and rye and vetch were returned to their respective plots as surface mulch. This increased the following crop of Sudan grass 3-fold.

[1141] 631.434:632.651.6
DUTT, A. K. **Earthworms and soil aggregation.** *J. Amer. Soc. Agron.* 40, 1948 (407-410).

Earthworms together with either finely divided lucerne hay, wheat straw or forest leaves were applied to the surface of a sieved loam in pots. The moisture content was kept at the moisture equivalent, and samples were taken for aggregate analysis from the 0-3-inch layer on 3 dates over 6 months. Lucerne hay, with worms, produced the highest aggregate stability, and without worms caused a significant increase in stability. None of the other treatments, with or without worms, had a significant effect.

The stability of earthworm casts from cultivated, pasture and forest soil in place was always greater than that of the 0-3-inch depth of the soil, being 3 times greater in the cultivated soil.

[1142] 631.434 : 632.651.6
EVANS, A. C. **Studies on the relationships between earthworms and soil fertility. II. Some effects of earthworms on soil structure.** *Ann. Appl. Biol.* 35, 1948 (1-13). [Rothamsted]

Measurements were made of the numbers of worms and weights of wormcasts in eight cultivated or pasture fields. Cultivation caused a rapid fall in numbers of worms. The weight of wormcasts depended in all fields on the numbers of two species—*Allolobophora longa* Ude and *A. nocturna* Evans—and on the mean size of the individuals of these species. Small worms produced a greater weight of castings than did an equal weight of large worms, indicating that growing worms are more active than adults. The weight of casts produced per acre per annum was from 1 to 25 tons, and it was calculated that from 4 to 36 tons/acre/annum pass through the alimentary tracts of all the worms present, some of which do not cast on the surface. The time required for the top 4 inches of soil to pass through the alimentary canal of worms was calculated to be 11½ years in old pasture and 80 years in an arable field with a low earthworm population. The percentage pore space of a soil containing a high population of wormcasting species was much greater than that of a soil with high populations of non-wormcasting

species. In two old pastures the proportion of coarse sand was found to increase with depth, and it is suggested that one reason for this may be the comminution by worms of the coarse-sand particles in the upper soil horizons.

[1143] 631.434 : 633.51
WELLS, W. G. **Soil structure studies, Queensland.** *Emp. Cott. Grow. Corp. Rept.* 1946-1947, 1948 (3).

The sizes of aggregates were no larger in soils under cotton rotated with sorghums than in soils under continuous cotton. Plots under Rhodes grass for 4 years had a greater percentage of aggregates of over 0.7 mm. than did areas under Sudan grass or those under Rhodes grass for 2 or 3 years. In a sandy clay soil which was becoming less permeable to summer rainfall and on which winter wheat had been grown repeatedly for over 20 years, the 7-12-inch layer had a much greater percentage of large aggregates than had the 0-6-inch layer. The area has been planted to Rhodes grass for several years.

[1144] 631.436 : 581.5
HURSH, C. R. **Local climate in the Copper Basin of Tennessee as modified by the removal of vegetation.** *U.S.D.A. Circ.* 774, 1948, pp. 38.

3 contiguous areas that were once forested but are now forested, grassed and bare have distinctive local climates. When vegetation was in full leaf the mean monthly maximum air temperature was 2.1-3.5°F. higher in the bare area than in the forest. When the forest was not in leaf the air temperature was 0.6-2.0° higher in the bare area. During the months of full foliage the mean daily range of soil temperature at 1-2 inches depth was 33.5° in the bare area and 10.9° in the forest. Total yearly evaporation for the 3 zones were : bare area 57 inches, grass zone 46 inches and forest 18 inches.

[1145] 631.436.6
KOKKONEN, P. **[Observations on the soil frost in the winter 1941-1942.]** *Acta Forest. Fennica* 50, No. 22, 1942 (1-11). *Biol. Abs.* 21 (2523). [Fig.]

After the unusually cold winter of 1941-42 a layer of pure ice 20-25 cm. thick persisted about 40 cm. below the soil surface in farmland in S. Finland. The ice did not melt until mid-July.

[1146] 631.436.6.005
BAC, S. **Przyrząd do badania ruchów warstw gleby wskutek przenikania mrozu. [A device for investigating the movements of soil layers resulting from frost-penetration.]** *Przeg. Doświad. Roln.* 3, 1947 (131-132). [Pl.]

This consists of a rectangular steel frame about 170 cm. high and broad, attached to stout foundation plates at a depth of 120 cm. below the soil surface so that the horizontal beam of the frame is about 50 cm. above the soil surface. Aluminium plates 10 cm. sq. are buried horizontally in the soil beneath the beam at depths of from 2.5 to 30 cm., and rods attached to them project through the beam at intervals of 20 cm. Soil movements due to frost-heaving and the like raise and lower the rods, and daily or more frequent measurement of the lengths of rod above the beam indicates the extent of vertical movement of the corresponding soil layers.—R.N.

631.44 SOIL TYPES

(See also Abs. Nos. 1156, 1370, 1380)

[1147] 631.44 : 93
STRZEMSKI, M. **Materiały do poznania gleb polskich. Tom. 6. Zarys rozwoju naukowej systematyki gleb. [Studies on Polish soils. Vol. 6. Outline of the development of the systematics of soil.]** *Mem. Inst. Natl. Polon. Econ. Rur. Pulawy* 18, series A, 1947, pp. 340. [Pl.e.]

A historical survey of soil classifications from the time of Theophrastus, but mainly concerned with systems put forward in the 19th and 20th centuries. S. A. Zakharov's system (1927) is considered the most promising for future development. 639 references.

[1148] 631.445.7 : 631.458 : 634.9
RAWITSCHER, F. **Die Erschöpfung tropischer Böden infolge der Entwaldung. [Exhaustion of tropical soils following the clearing of forests.]** *Acta Trop.* 3, 1946 (211-241). *Biol. Abs.* 22 (171). [Univ. São Paulo, Brazil]

Soil degradation after clearing forest is rapid in tropical humid climates. Deforestation which leads to leaching is particularly harmful because of the small power of absorption of tropical clays so that the

cations are easily washed out. The intense rock decomposition results in the formation of a depth of 10-20 m. or more of soil and the excess water of the rainy period percolates to these depths. Tree roots reach down to the decomposing rocks whence fresh ions are brought in solution, making up the losses by lixiviation. The movement of these salts to the surface soil ceases when trees are felled. To control lixiviation, agricultural methods of temperate climates should be avoided; shallow-rooted, short-lived crops and bare fallow are harmful.

[1149] 631.445.7 : 631.821.1 : 631.416.2
KOCH, D. E. V. **The liming of soils.**
Trop. Agricst. 103, 1947 (40-42).

Hydrated lime and burned lime are more effective than ground limestone in flocculating heavy soils. Liming increases the availability of P in most lateritic soils in the tropics where losses of Ca are great.

[1150] 631.445.73 : 631.48
HUMBERT, R. P. **The genesis of laterite.**
Soil Sci. 65, 1948 (281-290). [Saratoga Labs., Inc., Saratoga Springs, N.Y.]

Laterites were not found in New Guinea in areas of continuously moist climate. The best examples were found in zones of intermittent saturation with climates between humid and arid, at elevations between 500 and 2000 feet, almost always on level or gently sloping ground. There is a constant struggle between forest and grass. In the formation of the iron crust, an early stage is the formation of concretions by the dehydration of Fe_2O_3 precipitated around certain nuclei. The concretions eventually coalesce or become indurated by connecting veins of precipitated iron oxides running through channels of the weathering matrix.

631.453 TOXICITY IN SOILS

(See also Abs. Nos. 1245, 1247)

[1151] 631.453 : 546.19
CLEMENTS, H. F.; MUNSON, J. **Arsenic toxicity studies in soil and culture solution.** *Pacific Sci.* 1, 1947 (151-171). *Biol. Abs.* 21 (2537). [Univ. Hawaii, Honolulu]

Bush bean, Sudan grass and tomato were grown in an infertile red residual soil and in a fertile black alluvial soil to which arsenite was added to give a range of 14-3000 p.p.m. of As. In the black soil, Sudan grass grew in all As levels up to 700 p.p.m., and growth failed completely at 2000 p.p.m. In the red soil, Sudan grass was affected at levels beyond 104 p.p.m. and growth failed at 414 p.p.m. In the black soil, tomato grew successfully with levels of As up to 3000 p.p.m.; in the red soil growth was checked at 500 p.p.m. and stopped at 600 p.p.m. In the red soil, growth of bean was checked at 200 p.p.m. and failed at 414 p.p.m.

631.458/9 SOIL EXHAUSTION AND EROSION

(See also Abs. Nos. 1178, 1179)

[1152] 631.458 : 631.58
DUTHIE, D. W.; DOUGHTY, L. R. **Soil fertility in relation to soil conservation.**
C.R. Sem. Agric. Yangambi 1, 1947 (290-294).

African soils are generally of low fertility, and it is often a question of enhancing rather than of conserving their fertility before they can be brought into economic production. This is not possible without the use of fertilizers brought in from outside. Much can be done to improve the effectiveness of fertilizers by improving the soil's physical structure. In this connection there are great possibilities in the grass rotation which functions differently on heavy and light soils. On heavy soils the effect of deep-rooted grasses is to produce a crumb structure which permits rapid penetration of rain; on light soils the effect is to raise the organic-matter content of the top layer and to produce a sod which, when ploughed in, will provide a colloidal sponge to retain moisture and nutrients.

It is suggested that in places which are too steep for cultivation, natural processes of regeneration can be accelerated in humid regions by planting cinchona, wattle or eucalyptus.

[1153] 631.458 : 631.58
DOUGHTY, J. L. **The maintenance of organic matter in the brown soils.** *Sci. Agric.* 28, 1948 (88-95). [Soil Res. Lab., Swift Current, Sask.]

Cultivation of the brown prairie soils of western Canada has resulted in losses of approximately 18% of N and 20% of the organic matter as determined by comparing adjacent virgin and cultivated land within a few years of breaking. This loss has increased the susceptibility to erosion of these soils, but available data indicate that, after an initial decrease, yields maintain a steady level which is only slightly affected by fertilizers. Soil mining (wheat-fallow rotation) is the chief cause of erosion. At present there is no legume suited to the dry-land condition, and at least 4, but preferably 6-8 years are required under grass to give substantial increases in organic-matter content. Analyses showed, however, that brome and crested-wheat-grass sod lost as much organic matter and N in 2 years after breaking as was accumulated during the 4 years the areas were in grass, and that the losses of organic matter during a 31-day period from cultivated land and native, crested-wheat and brome sods were 1035, 2325, 2842 and 2306 lb./acre respectively. The return of all crop residues to the soil would considerably reduce the annual loss of N and organic matter, conserve moisture and control erosion, and is recommended especially for the medium- and fine-textured brown soils.

[1154] 631.459:551.577
 WOODBURN, R. **The effect of structural condition on soil detachment by rain-drop action.** *Agric. Engng.* 29, 1948 (154-156).

Tests were made with artificial rain to determine the amounts of soils, both pulverized and with undisturbed structure, lost by splash erosion. It was found that curves of the types $S = KE^p$ fitted most of the data quite well, where S is the amount of soil splashed, E the applied energy expressed as the time during which rain fell, and K and p are constants depending on the soil. Duplicate tests with pulverized soils agreed well, but there were wide variations in tests with undisturbed soils. Splashing from pulverized soils was much larger than from undisturbed soils. Soils varied greatly in their resistance to splash. The splash rate fell when the rainfall was prolonged.

[1155] 631.459:631.416/7
 KURON, H.; JUNG, A. Auswirkungen der Bodenerosion auf Diluvialböden Norddeutschlands. [Effects of erosion on diluvial soils of North Germany.] *Ztschr. Pflanz. Düng.* 39, 1948 (50-70). [G.]

A hilly area of 3½ ha. of old arable land on boulder marl, consisting of a slope draining mainly to the south and a trough with a south-east to north-west axis, was mapped with contour intervals of 1 m. The altitude varied between 80 and 110 m. Soil-profile samples were taken from points 20-50 m. apart along 9 lines roughly at right angles to the contours, and were analysed for grain size and humus content for 10-cm. layers to a depth of 100-150 cm., and for root-soluble P_2O_5 and K_2O (Egnér's method) to 30 cm. The following tendencies were clearly marked: on summits and the steeper upper slopes and concave slopes, the silt and clay contents were high due to the erosion of the upper soil and to the corresponding relative rise of the subsoil, rich in fine particles. On gentler upper slopes silt and clay contents were rather lower, but the position was complicated by some deposition of transported material. On weakly concave slopes transported material, including some sand, was deposited. In the zone of sand deposition proper, at the foot of the slopes, the clay and silt percentage was distinctly low, but rose again in the deepest parts. The humus content increased steadily from the summits downwards. P_2O_5 , having the same migration tendencies as the fine particles, was very much reduced on the steep slopes and in the sand-deposition zone. K_2O , due to a tendency to descend to deeper soil layers, decreased steadily but gently from the summits downward.

[1156] 631.459:631.47
 DIJK, J. W. VAN; VOGELZANG, W. L. M. **The influence of improper soil management on erosion velocity in the Tjiloet-oeng Basin (Residency of Cheribon, West Java).** *Meded. Alg. Proefsta. Landbouw* 71, 1948, pp. 9. [E.] [Inst. Soil Res. Buitenzorg, Java]

Records of discharge, silt content and content of dissolved matter were taken thrice daily throughout 1911-12 and 1934/35 from a stream draining about 62,000 ha. Soil loss increased over the period from 1 mm. per

year to 2 mm. due to increasing deforestation and grazing and "ladang" cultural methods. About 90% of the eroded material came from the miocene formations covering 66% of the area, and 10% from the andesitic volcanic formations covering 34% of the area. The percentage of rainfall appearing as run-off was about 45 in both periods.

631.46 SOIL MICROBIOLOGY

(See also Abs. Nos. 1217, 1242, 1252, 1273, 1347)

[1157] 631.461.2
CONN, H. J.; DIMMICK, I. **Soil bacteria of the genus *Arthrobacter***. *Soil Sci.* 65, 1948 (349-351). [N.Y. Agric. Expt. Sta. Geneva]

Cultures of the organism originally described as *Bacterium globiforme* and now recognized as *Arthrobacter globiforme*, exhibit differing diastatic action on starch. It is proposed to retain the name *globiforme* for those species giving a positive reaction and to introduce the name *simplum* for those giving a negative diastatic reaction.

[1158] 631.461.2
PILLAI, S. C.; WADHWANI, T. K.; GUR-BAXANI, M. I., ET AL. **Observations on nitrite-producing bacteria from different sources and the role of protozoa in nitrification**. *Curr. Sci.* 17, 1948 (122-123). [Inst. Sci., Bangalore]

Nitrification in aerated sewage, compost, etc., started only after flocculation of the suspended and colloidal matter. Nitrite was formed after aeration for 24-72 hours, depending on the nature and concentration of the organic matter and the inoculum. Nitrate was formed after aeration was prolonged for 72-96 hours. Nitrite-producing bacteria are commonly distributed in nature, but the amounts of nitrite produced by bacteria alone are less than those formed in the presence of protozoa such as *Vorticella* spp. that occur in activated sludge. The addition to composts of small amounts of activated sludge increases nitrification.

[1159] 631.461.3 : 631.411.2
DROUINEAU, G.; GOUNY, P.; LEFÈVRE, G. **Sur la nitrification dans les sols calcaires. [Nitrification in calcareous soils.]** *C.R.* 226, 1948 (957-958). [F.]

In laboratory studies of the biological oxidation of NH_3 , a soil with only a trace

of CaO was compared with one containing 58% CaO. 21.4 mg. of N as $(\text{NH}_4)_2\text{SO}_4$ were added to 100 gm. of soil which were incubated in thin layers at 15° and 28°C. The humidity was maintained at $\frac{2}{3}$ of the saturation capacity. In the calcareous soil the rate of formation of nitrite was greater than that of nitrate so that after 6 days at 28° the amounts of nitrite N were 0.6 and 9.0 mg., and of nitrate N 9.5 and 12.2 mg. for the non-calcareous and calcareous soils respectively. A similar observation when both soils were sterilized and reinoculated and the increase in nitrite content following the addition of CaCO_3 to the non-calcareous soil suggest that modifications in the relative rates of nitrite and nitrate formation are due to the presence of CaCO_3 .

[1160] 631.461.3 : 633.51
WELLS, W. G. **Soil moisture and nitrification studies, Queensland**. *Emp. Cott. Grow. Rept.* 1946-1947, 1948 (5).

In seasons of no winter rainfall and very little spring rainfall the nitrate content of the 0-6-inch layer of old fertile cotton cultivations rose rapidly to over 30 p.p.m. after rainfall in October and November. Such quantities of nitrates stimulate vegetative growth which reacts severely to hot, dry periods later in the season.

[1161] 631.461.51
MOLNAR, D. M.; BURRIS, R. H.; WILSON, P. W. **The effect of various gases on nitrogen fixation by *Azotobacter***. *J. Amer. Chem. Soc.* 70, 1948 (1713-1716). [Univ. Wis.]

The effects of He, A, Ne, H, C_2H_6 and N_2O on N fixation by *Azotobacter* were investigated by means of the micro-respiration technique and total-N determinations. N fixation was inhibited by H and N_2O . If the physiological responses of *Azotobacter* could be ascribed to the physical characteristics of the gases it would be expected that N fixation would be correlated with the van der Waals constant for the diluent gas. This was not so. Inhibition by N_2O was specific for N fixation as distinct from assimilation of combined N.

[1162] 631.461.51 : 551.5
BORTELS, H. **Meteorobiologische Untersuchungen an *Azotobacter***. [Meteorobiological studies of *Azotobacter*.] *Zbl. Bakt.* II, 102, 1940 (129-153). *Ztschr. Pflanz. Düng.* 39, 1947 (75-76). [G.]

Increases or decreases in the rate of growth or N fixation of *Azotobacter* are much more closely related to rises and falls in the atmospheric pressure than to the temperature, humidity, chemical composition or ionization of the air or to capillary forces.

[1163] 631.461.52
POCHON, J.; TCHAN, Y. T. Recherches sur la nutrition carbonée des *Azotobacter*. [Studies on the carbon nutrition of *Azotobacter*.] *Ann. Inst. Pasteur* 73, 1947 (36-41). [F.]

The carbon nutrition of *Azotobacter* was studied with various sugars, alcohols and organic acids. Only those substances producing very luxuriant growth on silica-gel plates, i.e., mannitol, glucose, saccharose, starch, pyruvic acid and ethyl alcohol, appeared to be utilizable on soil plates. Addition to silica-gel plates of an aqueous extract of the soil used completely inhibited the growth of *Azotobacter* when butyric and benzoic acids, but not when mannitol, formed the source of C.

[1164] 631.461.52 : 576.809.7
CASAS CAMPILLO, C. Presencia en el suelo de sustancias inhibidoras del crecimiento de *Rhizobium*. [The presence in soil of substances inhibiting the growth of *Rhizobium*.] *An. Esc. Nac. Cienc. Biol.* 4, 1947 (339-352). [Sp.e.] [Esc. Nac. Cienc. Biol. Mexico, D.F.]

Five soils cropped with lucerne or French beans yielded ether- and alcohol-soluble extracts possessing marked bacteriostatic action on *Rhizobium japonicum*, *R. phaseoli*, *R. trifolii* and *R. meliloti*. The petroleum-ether-soluble fraction of an ether extract showed bactericidal effect against *R. meliloti*. The pH, texture and organic-matter content were not correlated with the presence of inhibitory substances, which moreover were not found in 2 virgin soils tested. The main factor responsible for the presence of these substances seemed to be the establishment of *Rhizobium* in the soil. This fact, together with the solubility characteristics of the active preparations, suggests the presence of antibiotics in the extracts.

[1165] 631.461.61
POCHON, J.; TCHAN, Y. T. Recherche sur l'activité relative des microorganismes cellulolytiques aérobies et anaérobies dans le sol.

[Research on the relative activity of aerobic and anaerobic cellulolytic micro-organisms in the soil.] *Ann. Inst. Pasteur* 73, 1947 (29-36). [F.]

By adapting the Winogradsky method to the study of cellulolytic micro-organisms it was shown that aerobic bacteria and fungi multiply at and above rH 14, and anaerobes at and below rH 5.8. Tamping the soil, high humidity and high incubation temperatures favoured the anaerobes rather than the aerobes; above 35° and 35% saturation the former alone were active. Optimum conditions for the development of fungi and aerobic bacteria to a depth of 30 cm. are provided by a well-worked, well-aerated, N-containing soil with temperatures varying from 5 to 25° and without long periods of intense rain. Under wet tropical conditions anaerobes may be the only organisms functioning.

[1166] 631.461.74 : 631.875
WEBLEY, D. M. Aerobic mesophilic bacteria in composts. *Nature* 161, 1948 (174). [Macaulay Inst. Soil Res.]

The numbers of aerobic mesophilic bacteria on composts made from grass cuttings were reduced at the high-temperature phase (65-55°C.), but rose sharply with fall in temperature. A similar course was found in straw composts.

[1167] 631.462
KOOT, Y. VAN; WIERTZ, G. Onderzoek naar de afstervings-temperaturen van enkele voor de plantengroei schadelijke bodem-organismen. [Investigations of the death temperatures of some soil organisms injurious to plant growth.] *Tijdschr. PlZiekt.* 1947 (121-133). [Du.e.] [Proeft.Z.-Hollands Glasdistrict]

The mortality of various organisms injurious to plant growth was investigated at different temperatures. The period of heating (x) and the death temperature (y) could be expressed by a curve of the form $(y-a)\sqrt{x} = b$. The temperatures at which complete killing was obtained were 70°C. for *Fusarium*, 60°C. for *Sclerotinia* and *Verticillium* (from cucumber), 55°C. for *Heterodera* and 50°C. for *Verticillium* (from tomatoes) and *Agriotes*. During, and for 3 hours after steam sterilization it is desirable to keep the ground covered.

[1168] 631.466.2
ERIKSON, D. Differentiation of the vegetative and sporogenous phases of the Actinomycetes. II. Factors affecting the development of the aerial mycelium. *J. Gen. Microbiol.* 1, 1947 (45-52). [Rothamsted]

When first isolated on soil-extract agar, soil Actinomycetes consistently produce aerial spores in surface colonies. They retain this property in sterile soil or when grown on washed suspensions of common soil bacteria in a water agar medium. In soil, when the composition, moisture content and temperature are kept constant, the initial stimulus towards production of an aerial mycelium is free access of air. Once growth is established the next most important factor stimulating sporulation in the soil is dehydration. In natural and sterilized soils of different origins and in a "synthetic" soil, each containing 250 p.p.m. of N as nitrate, the modes of growth of different actinomycetes were uncharacteristic.

[1169] 631.466.2 : 576.809.7
KOCHOLATY, W.; JUNOWICZ-KOCHOLATY, R.; KELNER, A. Actinomycin A produced by a soil *Actinomyces* different from *Actinomyces antibioticus*. *Arch. Biochem.* 17, 1948 (191-193). [Univ. Penn.]

A species of *Actinomyces*, possibly *A. parvus* Krainsky, which produces actinomycin A was isolated from a sample of unmanured soil.

[1170] 631.466.2 : 576.809.7
TRUSSEL, P. C.; RICHARDSON, E. M. Actinomycin from a new *Streptomyces*. *Canad. J. Res.* 26C, 1948 (27-30). [Ayerst, McKenna and Harrison Ltd., Montreal]

A hitherto undescribed species of *Streptomyces* was isolated which produces actinomycin in submerged culture.

[1171] 631.466.4
PLOTTO, O. VON. Untersuchungen an Proactinomyceten. [Studies of proactinomycetes.] *Naturwissenschaften* 33, 1946 (124-125). *Ztschr. Pflanz. Düng.* 39, 1947 (76-77). [G.]

A presentation of some morphological and physiological differences between the ruber, flavus and citreus groups. These organisms are concerned in the elaboration of heterocyclic C-N compounds of humus.

[1172] 631.467.1 : 551.482
GRAY, E. Ciliate protozoan fauna of soil and inland waters. *Nature* 161, 1948 (854-855). [Botany School, Cambridge]

Observations on a chalk stream and the soils on its banks indicate that there is a free interchange of ciliate protozoa and bacteria between the soil and inland waters, and that any distinction between them is apparent and not real.

[1173] 631.467.2
FRANZ, H. Untersuchungen über die Kleintierwelt ostalpiner Böden. I. Die freilebenden Erdnematoden. [Studies of the soil microfauna of the eastern Alps. I. The free-living soil nematodes.] *Zool. Jahrb. (Syst.)* 75, 1942 (365-546). *Ztschr. Pflanz. Düng.* 39, 1947 (72-73). [G.]

The distribution and density in the soil, the phenology, reproduction, soil-biological significance and grouping according to nutritional habits are treated in detail for 162 species, most of which—especially those of soil-biological importance—were found in all soils under all climatic conditions. Very few are harmful to plants, and some take a part in cellulose and protein decomposition and in humification.

[1174] 631.468 : 634.9
DELAMARE-DEBOUTTEVILLE, C. Etude quantitative du peuplement animal des sols suspendus et des épiphytes en forêt tropicale. [Quantitative study of the animal population of "suspended soils" and epiphytes in tropical forest.] *C.R.* 226, 1948 (1544-1546). [F.]

Suspended soils are those formed on the largest branches of tropical trees by the decomposition of epiphytes, plant debris and accumulated dust and siliceous concretions. The fauna of such a soil, 20 cm. in thickness and suspended at a height of 45 cm. on a *Parinarium* branch, is listed. The population was scanty, consisting of 40 individuals compared with 100 in a similar volume of ordinary soil. The population of epiphytic tufts consisted of the same species, but fewer individuals than that of the suspended soils, suggesting stabilization and the establishment in a constant biotope of fauna elements which are only temporary in epiphytic tufts.

631.47 SURVEYS

[1175] 631.471
MUIR, A. **Some recent developments in soil survey and pedology.** *Agric. Prog.* 22, 1947 (99-105).

A review is made of the development of the Soil-Survey organization in England and Wales and of recent changes in its administration. Headquarters has moved from Bangor to Rothamsted and the Survey has been brought under the jurisdiction of the Agricultural Research Council. At the same time a Pedology Department has been established at Rothamsted.

Developments in petrology, X-ray, spectrography and chemical investigations are discussed and the importance of investigating theories of soil formation and gleying is stressed. The static and dynamic approaches to soil classification are described and the early world-wide classifications of the Russians and Americans are compared. Later developments of classification were into zones, associations, catenas, etc., or according to soil drainage, cycles of weathering, amounts of exchangeable bases and, most recently, according to the clay fraction identified by X-ray examination.

631.48 SOIL FORMATION

[1176] 631.48
STEPHENS, C. G. **Functional synthesis in pedogenesis.** *Trans. Roy. Soc. S. Aust.* 71, 1947 (168-181).

Jenny's and Wilde's equations relating soil properties to the individual soil-forming variables and to time are shortly discussed and a representation of the soil as the integral of a set of differential equations is presented, in which the variables may have both dependent and independent status. Relatively simple pedogenetic diagrams, covering all the soils surveyed over widely separated areas of 600, 100 and 5 square miles, show that each soil series is a synthesis of the functions of climate, organisms, relief, water table, parent material and time. The diagrams give qualitative expression to Jenny's variables, and facilitate recognition of his soil sequences, which are segregated in different parts of the diagrams.

631.5 CULTURAL OPERATIONS

(See also Abs. Nos. 1098, 1268, 1306, 1351)

[1177] 631.512 : 525.5
ATHANASIU, N. **Über Sommer- und Herbstfurche. [Summer and autumn ploughing.]** *Ztschr. Pflanz. Düng.* 39, 1947 (132-137). [G.]

Fertile red-brown forest soils near Bucharest, under the rotation maize, oats, peas, winter wheat, were ploughed to a depth of 10 or 20 cm. (a) both in summer, immediately after harvest, and in autumn, being harrowed in summer when a crust formed, and (b) in autumn only. The climate is characterized by hot summers, severe winters and by rain in early summer and in winter. The main conclusions were that summer ploughing increased the October water content by 25-30%, the N content by 130% and the winter-wheat yield by 30%. The differences in depth of ploughing had no clearly defined effects.

[1178] 631.544.7 : 631.416.13
MCALLA, T. M.; RUSSEL, J. C. **Nitrate production as affected by sweetclover residues left on the surface of the soil.** *J. Amer. Soc. Agron.* 40, 1948 (411-421).

In areas of limited rainfall, the ploughing-in of legume residues may so increase the nitrate content of the soil as to over-stimulate plant growth. The development of nitrates in soil (a) cultivated by sub-surface tillage, with sweet-clover residues left on the surface and (b) with sweet-clover residues ploughed under, was compared in a silty clay loam of pH 5.4-5.7, with N and organic-matter contents of 0.17% and 3.4% respectively in the 0-6-inch layer.

In the first year after 1 year of sweet clover the mean available N to a depth of 6 feet was 7% less with treatment (a) than with (b); in the first year after 2 years of sweet clover it was 10% lower. With both treatments sufficient N was produced for large crop yields, and (a) should be especially valuable on soil depleted by erosion.

[1179] 631.58 : 551.48
HICKOK, R. B.; MAYER, I. D.; KOHNKE, H. **Some runoff control and moisture conservation possibilities.** *Agric. Engng.* 29, 1948 (257-261).

Rainfall and run-off are being measured on twelve small catchments in close proximity and ranging in area from 2 to $3\frac{1}{2}$ acres. They were rotated with corn-wheat-meadow from 1942 to 1945 and with corn-soybean-wheat-meadow, starting in 1946. With the 4-year rotation three of the four crops are represented each year. For each crop one catchment is given the ordinary treatment (straight-row seeding, moderate fertilizing, etc.) and another is given conservation treatment (contour seeding, heavy fertilizing and manuring, return of all crop residues).

Results to date point to the provisional conclusion that run-off under corn and wheat is similar and about twice as much as under meadow. Conservation treatment more than halved the annual run-off under corn and wheat, but had little effect on run-off under meadow. All the 17 occurrences of peak run-off rates exceeding 2 inches an hour (these would account for most of the erosion losses) were from treatments under corn—13 from the ordinary and 4 from the conservation treatments. The frequency of critical run-off rates appears to be directly related to the frequency of intertilled crops in the rotation. Moisture saved by a reduction in run-off under the conservation treatment resulted in increased crop yields, and an estimate is made of the average annual increase in corn yields that would result from the adoption of the conservation system of the experiment.

[1180] 631.589
STAPLES, R. R. **Veld burning.** *Rhod. Agric. J.* 42, 1945 (44-52).

The information at present available is summarized, and it is concluded that "uncontrolled non-burning may, under certain conditions, be almost as great an evil as uncontrolled burning." The effects of burning vary with different types of veld which are classified as sweet, mixed and sour veld. The effects of burning and the burning treatments for each type of veld are described. The need for burning is greater with the sour veld, whereas it is normally undesirable to burn sweet veld.

631.6 RECLAMATION. DRAINAGE. IRRIGATION

(See also Abs. Nos. 1097, 1263, 1372, 1391)

[1181] 631.612
WEST VIRGINIA AGRICULTURAL EXPERIMENT

STATION. **Will strip-mined lands produce again?** *W. Va. Agric. Expt. Sta. Bull.* 330, 1947 (11).

Strip mining gives acid spoil, sweet spoil or intermediate spoil. Acid spoil should lie idle for 2-3 years. 3-5 tons/acre of limestone, 8 loads/acre of manure and 500 lb./acre of super. should then be worked into the soil with a springtooth. Clovers, lespedezas, ryegrass, timothy and orchard grass can then be grown, but should not be grazed or cut the first season. Sweet spoil and intermediate spoil do not require lime. They should be worked with a springtooth and sown to clovers and grass. All legumes should be inoculated before seeding.

[1182] 631.612
BROWN, R. L. **Permanent coastal dune stabilization with grasses and legumes.** *J. Soil Water Conserv.* 3, 1948 (69-74). [S.C.S. Portland, Oreg.]

Hairy vetch provides N, shade and litter and its use in a seed mixture can provide permanent cover in one seeding. The most satisfactory mixture contains hairy vetch, ryegrass, tall fescue, red fescue and purple beachpea. The vetch and ryegrass grow rapidly and provide surface protection while the other plants become established. On infertile beach dunes 300 lb./acre of 16-20-0 fertilizer should be applied to the newly seeded mixtures. 150 lb./acre were not sufficient.

[1183] 631.612
TYNER, E. H. ; SMITH, R. M. ; GALPIN, S. L. **Reclamation of strip-mined areas in West Virginia.** *J. Amer. Soc. Agron.* 40, 1948 (313-323).

Investigations were begun in 1943 on the revegetation of spoil from coal-mining operations. A strongly acid, non-calcareous, pyrites-containing spoil was limed at 5 tons/acre of CaCO_3 , just before seeding. Germination and early growth were good, but within 60 days large moist areas became barren because of excessive acidity (pH 3.0), caused by H_2SO_4 released through oxidation of pyritic materials. Although applications of lime and fertilizer resulted in growth of vegetation, this type of spoil presents a difficult problem. Delaying reclamation for 1-3 years until the bulk of the pyritic S had been oxidized and the acidic by-products

leached out, has reduced the amount of lime needed and increased the chance of securing a satisfactory vegetative cover.

Calcareous soil underwent a period of active acidulation, but it contained sufficient CaCO_3 to neutralize the acids produced. Spoil derived from a low-S coal was slightly acid and did not undergo a period of active acidulation. Light applications of lime were desirable for legumes.

The spoil is usually spread out to form bench terraces and is compacted to a depth of 18-24 inches. Beneath this layer the spoil is loose. Young seedlings, grasses and some legumes suffer during drought due to interference of the compaction with their normal rooting depths, but tap-rooted legumes penetrate the layer and are not affected by ordinary drought. They should help in breaking up the surface compaction and increasing permeability.

[1184] 631.613
SMITH, D. D. **Design of a terrace system from hydrologic data.** *Agric. Engng.* 29, 1948 (263-266).

[1185] 631.613 : 631.81
ROBERTSON, D. W.; GARDNER, R. **Restoring fertility to land where levelling operations have removed all the top soil and left raw subsoil exposed.** *Proc. Amer. Soc. Sug. Beet. Tech.* 1946, 1947 (33-35). *Biol. Abs.* 21 (2524). [Agric. Expt. Sta., Fort Collins, Colo.]

Manure increased the yield of barley 107% over the control plots, and plots receiving super. in addition gave slightly higher yield. There was no significant difference in total N and P in the grain from treated and untreated plots.

[1186] 631.615
CARR, W. A. C.; MERCER, W. B. **Reclamation of Frodsham marshes.** *J. Roy. Agric. Soc. England* 108, 1947 (112-126).

The soil is mostly shallow heavy alluvium. Some areas were suitable for immediate cultivation in 1942 when reclamation was begun; in others peat formed the surface soil. Following mole and pipe drainage and pumping, lime was applied at an average of 3-4 tons/acre of CaCO_3 . At first this was applied only after ploughing, but later half the dressing was added to the turf and the

rest to the upturned furrow. Ploughing is done to a depth of at least 7 inches. The soil was low in P and 1 cwt./acre of ammonium phosphate was applied together with top dressings of N.

Wheat has grown well, oats are disappointing and barley failed on virgin turf, but has grown fairly well on limed land that had been cultivated for 3 years. After pumping, many of the ditches became mere trickles and water is brought back to the meadows in pipes.

[1187] 631.615
GRAFTON, DUKE OF. **Land reclamation on the Euston Estate. Further experiences.** *J. Roy. Agric. Soc. England*, 108, 1948 (127-129).

Results obtained between 1942 and 1946 on light sandy heath and parkland in Suffolk and the cultivations and manures applied are tabulated. Lucerne has grown well as a fodder crop and is the best possible preparation for a cereal crop.

[1188] 631.616
DORSMAN, C. **Schade aan tuinbouwgewassen ten gevolge van inundatie met zeewater. [Damage to horticultural crops from inundation with seawater.]** *Tijdschr. Pluizicht.* 53, No. 3, 1947 (65-86). *Biol. Abs.* 21 (2541). [Du.]

The inundating seawater contained 6-18 gm./l. of salt. Good structure can be regained by drainage, superficial cultivation and heavy applications of CaSO_4 . Fruit trees did not die when planted in drained soil whose water contained 7 gm./l. of salt.

[1189] 631.622
KARDOS, L. T. **Lysimeter studies with cultivated and virgin soils under sub-humid rainfall conditions.** *Soil Sci.* 65, 1948 (367-381). [Wash. Agric. Expt. Sta.]

Ebermayer lysimeters were installed in 1936 to contrast percolation losses from (a) a cultivated soil under the rotation peas and wheat and (b) a nearby plot of virgin soil under bunchgrass. The soil was a neutral silt loam becoming silty-clay loam at about 12 inches depth on a compacted silt loam situated at about 41 inches. The plots were on a 21% gradient. The percolates were analysed for total solids, loss on ignition,

SiO_2 , R_2O_3 , Fe_2O_3 , Ca, Mg, N, P and K. The Ebermayer lysimeter is suitable for measuring lateral subsurface flow. The percolation due to this form of flow at the 24-36-inch depth often attained a rate of $1\frac{1}{2}$ inches/hour, thus approaching erosive run-off values, but causing only slight soil loss within the profile. The true water table possibly took no part in this phenomenon. The quantity of percolation in the lateral funnels was 3 to 25 times as great as from any other funnel, and percolation from them persisted for a longer time after the cessation of rain. Nutrient losses by lateral transport within the profile were considerable. The greatest total losses probably occurred from the middle third of the slope, as the upper third would be less subject to lateral flow and the lower would receive some accumulations as the slope flattened. The pedogenic aspects of subsurface flow within this formation are discussed.

[1190] 631.67 : 631.347.22
BROOKSHIER, F. A. **Getting the sub up.**
Reclam. Era 33, 1947 (245, 248). Herb.
Abs. 18 (83). [San Luis Valley Project,
Colorado]

The San Luis valley of Colorado is the most important area in the United States for the practice of sub-irrigation. The normal water table is only 3 feet below the ground surface and the soil structure and grade of the land also encourage the practice of growing crops by means of underground water. A common method of sub-irrigating a crop is to cut small ditches through a field in the same direction as the slope and to allow about 0.5 cu. ft. of water per sec. to run down the ditches. Earth checks in these laterals retard the water flow and cause seepage below the field surface, thus allowing the subterranean water to be built up. A drainage network prevents the accumulation of excessive salts in the soil and close co-operation between different farmers is required for efficient operation of this irrigation method, which reduces water losses from evaporation, conserves plant nutrients and cuts labour costs.

[1191] 631.67 : 631.432.3
PEELE, T. C.; BEALE, O. W.; LESESNE, F. F.
Irrigation requirements of South Carolina soils. *Agric. Engng.* 29, 1948 (157-158, 161).

Two important soil properties to be considered in designing irrigation works are the infiltration rate and the amount of available water the soil can absorb. Tests with simulated rain showed that soils, with the exception of one with a very low clay content, absorbed more water in an hour when the soil was dry at the beginning of the test than when it was wet and compact. A mulch of crop residues greatly increased the infiltration rate; the same residues, incorporated into the soil 6 months before the test was made, had little effect.

The available-water-holding capacity, which is much used in western U.S.A. as an index of irrigation requirements, is mainly a function of the quantities of clay and organic matter in the soil and the properties of the clay. The relationship between available-water capacity Y (i.e. the moisture range between the permanent wilting point and the field capacity) and the organic-matter content X , expressed as percentages, is $Y = 6.64 + 0.876 X$.

[1192] 631.671 : 546.27
WILCOX, L. V. **Explanation and interpretation of analyses of irrigation waters.**
U.S.D.A. Circ. 784, 1948, pp. 8.

A table showing permissible boron contents of irrigation waters for sensitive, semi-tolerant and tolerant crops, and a diagram showing permissible sodium contents and conductivity values are given.

631.811 PLANT NUTRITION

(See also Abs. Nos. 1094, 1112, 1115, 1122, 1132, 1213, 1233)

[1193] 631.811
CHAPMAN, H. D. **Mineral nutrition of plants.** *Ann. Rev. Biochem.* 24, 1945 (709-732). Hort. Abs. 17 (234).

[1194] 631.811 : 539.16
SAUCHELLI, V. **Radioisotopes: an indispensable aid to agricultural research.**
Better Crops 32, No. 3, 1948 (10-18, 43-45). [Davison Chem. Corp., Baltimore, Md.]

The development of radioisotopic research is reviewed, especially in its application to plant-growth and tracer technique. The concentration of radioactivity ordinarily

used in experiments with radioactive fertilizers does not affect plant growth adversely. When 0.075, 0.375 and 1.875 millicuries of P^{32} were incorporated with 3 P fertilizers and added to 3 different soils in which rye was grown, no significant effects on the rye could be attributed to the radiation. On the other hand, claims that radioactive fertilizers give remarkably higher yields than ordinary fertilizers have not been proved.

Radiocalcium is used to study lime problems of the soil. Preliminary results show that poor crops on acid soils are not necessarily due to low Ca; plants may be unable to absorb Ca from acid soils which may be well supplied with soluble Ca. Radioactive Co, As, Cu, K, S and Fe are used in the study of plant and animal diseases, hormones and soils. In the study of plant chlorosis the use of radioiron and radiophosphorus have shown relationships between P uptake and Fe in the soil.

[1195] 631.811:539.16
TORSTENSSON, G. Isotoper som hjälpmedel vid biokemisk forskning. Anförande rörande användningen av isotoper inom växtfysiologien och gödselläran. [The use of isotopes in biochemical research. Statement regarding the use of isotopes in plant physiology and fertilizer studies.] *Kgl. LantbrAkad. Tidskr.* 87, 1948 (83-84). [Sw.e.]

C^{14} has been used in physiological studies and P^{32} in fertilizer studies in the U.S. With the help of C^{14} it has been shown that plants assimilate some CO_2 even in the dark. P^{32} has been used to determine what proportions of a plant's P supply come from the soil and from added fertilizer, and to trace the course of P in the plant.

[1196] 631.811:631.414.3
MATTSON, S. Laws of ionic exchange. III. Donnan equilibria in plant nutrition. *LantbrHögsk. Ann.* 15, 1948 (308-316). [E.] [Inst. Pedology, Uppsala]

If two soils of different exchange capacities contain the same proportion of a monovalent and divalent cation, then the soil with the higher exchange capacity should yield its monovalent ions more readily and its divalent ions less readily than the soil with lower exchange capacity.

If the equilibrium activity of the K ions is the same in the soil as in the roots, the

activity of the Ca ions will likewise be the same. The uptake of the ions by plants should be in the proportion in which they are present in the soil. When the equilibrium activity of the cations is greater in the roots than in the soil there should be a greater uptake of Ca ions, and when the equilibrium activity is greater in the soil than in the roots the uptake of K ions should be greater. To test this theory, barley plants were grown in kaolin and in bentonite-quartz sand mixture, saturated with varying proportions of K and Ca ions. The K/Ca ratios in 3-weeks-old plants were 3.0-19.8 in the kaolin plants and 4.9-55.4 in the bentonite plants. The difference is explained as a valence effect on the Donnan distribution of ions in a system of 2 colloidal phases of different ionic activities. It is suggested that different activities of the plant colloids may account for differences in the uptake of monovalent and divalent ions.

[1197] 631.811:631.415.3
MIBASHAN, A. Survey of literature on the influence of ions on plants and soils. *Palestine Bd. Sci. Indust. Res.* 1948, pp. 46.

Work on Ca, Mg, K, Li, Rb, Cs, Na, Cl, SO_4 , the ion-sensitivity of selected plants and recent theories of the mineral nutrition of plants is set out and discussed. The literature suggests that there is no causal correlation between the presence of harmful amounts of NaCl and the favourable action of added Ca and K, and that the addition of fertilizers may be effective only when the added salts are those which the plant lacked before the addition. While the osmotic interpretation of salt action accounts for the majority of the facts, a specific action of, for example, Mg and Na ions is unquestionable. Studies involving (a) the addition of fertilizer, (b) leaching of soil and (c) the desalting of water are suggested as approaches to the problem of ion effects.

[1198] 631.811.9
NOWOTNY-MIECZYŃSKA, A. Mikroelementy. [Trace elements.] *Przeg. Doświad. Roln.* 3, 1947 (200-220). [Pl.e.] [Inst. Agric. Res. Puławy]

A review indicating the importance of B, Mn, Cu, Zn, I, Se, Ni, Co, Mo and Cr in plant nutrition.—R.N.

[1199] 631.811.9 : 577.16
 LOO, T.-Y.; CHEN, S.-M. **Effect of some mineral elements on the vitamin C content of bean sprouts.** *J. Agric. Assoc. China, Suppl.* 50, 1945, pp. 21. Hort. Abs. 18 (53).

U, Mg and Zn enhanced the content and physiological activity of vitamin C.

[1200] 631.811.9 : 577.16
 LO, T.-Y.; CHEN, S.-M. **The promoting effect of some chemicals on vitamin C formation in vegetables in field experiments.** *Sci. Record (China)* 2, 1947 (84-87). C.A. 42 (2376).

Compounds of Zn, Ni and Mg as well as complete fertilizers increased vitamin C in chinese-lettuce leaves, lettuce stems, red peppers and tomatoes.

[1201] 631.811.91 : 631.81
 KRISCHE, P. **[Optimum water supply for agricultural crop plants : a fundamental problem in human nutrition.]** *Deut. Landw.* 1, 1947 (5-6, 25-29). B.A.BIII. 1948 (48). [G.]

Experimental data show a positive relationship between mean rainfall and average wheat yields, the beneficial effect of adequate water supplies on the utilization of fertilizers by crops and the economy in water consumption per unit dry-matter increase in plants effected by suitable manuring.

631.812/3 PROPERTIES OF FERTILIZERS

(See also Abs. No. 1214)

[1202] 631.813
 HARPER, H. J. **Effect of fertilizers on soil acidity and alkalinity.** *Okla. Agric. Expt. Sta. Bull.* B-312, 1947, pp. 11.

200 lb./acre of $(\text{NH}_4)_2\text{SO}_4$ or 274 lb./acre of NaNO_3 were applied annually to a native grass meadow for 15 years. The average pH of the $(\text{NH}_4)_2\text{SO}_4$ plot decreased by 0.7 and 0.2 in the 0-3-inches and 3-6-inches layers respectively. NaNO_3 prevented an increase in surface acidity and raised the subsurface pH by 0.3-0.4. Super. and K have little effect on soil reaction. Materials which correct acidity include basic slag, rock phosphate and wood ashes while farmyard

manure added over a long period reduces or retards development of acidity. Legume residues increase acidity.

[1203] 631.813
 DAVIES, E. B. **The mixing of fertilizers for single-dressing applications.** *N.Z. J. Agric.* 76, 1948 (271-272). [Soil Fert. Res. Sta., Hamilton]

A chart is presented which indicates whether any two fertilizer ingredients can be mixed. Factors involved include the reversion of soluble phosphates, moistness, loss of NH_3 and soil acidity.

631.816.3 FERTILIZER PLACEMENT

[1204] 631.816.3
 MUSIEROWICZ, A.; KRZYSZOWSKI, J. **Wpływ głębokości przykrycia nawozów pomocniczych na plony buraków cukrowych i ziemniaków uprawianych na słabo zbielicowanej glebie loessowej.** [The depth of covering of artificial fertilizers and its effect on sugar-beet and potato crops cultivated on slightly podzolized loess soil.] *Przeg. Doświad. Roln.* 3, 1947 (171-174). [Soil Inst., Agric. Coll., Warsaw] [Pl.e.]

Artificial fertilizers placed 0-3 cm. deep, 6-9 cm. deep and 12-15 cm. deep, had the same effect on yields and on the percentage of sugar in beet and of starch in potatoes. Depth of covering of fertilizers had no effect on the grain crop following potatoes and sugar beet.

631.82 MINERAL AMENDMENTS. LIME

(See also Abs. Nos. 1136, 1149)

[1205] 631.821 : 669.16
 KAPPEN, H. **[Recent experience with blast-furnace slag as fertilizer.]** *Stahl u. Eisen* 66/67, 1947 (307-312). C.A. 42 (2708). [G.]

Slags with 42% of $(\text{CaO} + \text{MgO})$ were successful on low-acid soil and on crops of low acid sensitivity. Increase in yield on neutral soil was not so marked, but, in crops receiving slag, resistance to severe climate

and blights was improved. Bacterial activity was increased by fertilizing with blast-furnace lime, and loss in humus was considerably less than with ordinary lime. The slag was effective for more than one season.

[1206] 631.821.1
MINISTRY OF AGRICULTURE AND FISHERIES.
The use of lime in agriculture. *Min. Agric. Bull.* 35, 1948, pp. 22.

In Britain many soils that were once well supplied with lime, as a result of the large amounts of chalk applied in bygone days, are now running dangerously short and a return to the practice of liming or chalking is essential to maintain soil fertility. The functions of lime, causes and rate of loss of lime from the soil, indications of the need for lime and chemical tests for soil acidity and lime requirement are described. Advice is given on different forms of lime, quantities to apply and time and method of application.

[1207] 631.821.1 : 546.19
MARGULIS, H.; GANE, J. Action de la chaux sur l'acide arsénieux. [**Action of lime on arsenious acid.**] *Ann. Agron.* 18, 1948 (28-32). [F.] [Sta. Agron. Toulouse]

As part of a study of the relationship between As compounds and soils, standard solutions of As_2O_3 were treated with increasing quantities of standard $Ca(OH)_2$ in such a way that the volume of the two reacting solutions was kept constant throughout the series. The $Ca(OH)_2$ and As_2O_3 in the supernatant liquids were estimated. By plotting the concentration of $Ca(OH)_2$ added against that of the As_2O_3 and $Ca(OH)_2$ precipitated the reaction was shown to comprise the precipitation of As as $Ca_2H_2(AsO_3)_2$ followed by its transformation into $Ca_3(AsO_3)_2$.

[1208] 631.821.1 : 631.453
LYND, J. Q.; TURK, L. M. **Overliming injury on an acid sandy soil.** *J. Amer. Soc. Agron.* 40, 1948 (205-215). [Mich. St. Coll., E. Lansing]

Overliming injury occurred in peach trees growing on loamy sand to which 2-3 tons/acre of lime had been added and which required only 1 ton/acre of $CaCO_3$ to bring it near neutrality. It is possible that an unfavourable ratio of Ca to Mg may have been produced with high rates of liming. Also a

deficiency of Fe, Cu or Zn may have been induced, although results indicate no appreciable deficiency. Overliming injury was not prevented or corrected by the addition of B to the soil, but was partially prevented by adding P and Mn. There was a marked decrease in exchangeable Mn in the soil with increasing rates of lime, but the quantity of exchangeable K and adsorbed P was not much affected.

[1209] 631.828 : 546.56
ARENZ, B. Dreijährige Gefässversuche zur Prüfung der Kupferdüngung und ihrer Nachwirkung. [**Three-year pot tests of copper fertilizing and its residual effect.**] *Ztschr. Pflanz. Düng.* 39, 1947 (125-132). [G.]

The effects of 12.73 kg./ha. of Cu given (a) as $CuSO_4$ or (b) as an industrial Cu-containing iron-oxide sludge were compared on a Cu-deficient moorland soil of pH 3.5, chalked to a pH of 7.0. The control received a complete fertilizer without Cu. Oats on this soil died without Cu or at best failed to fruit, but gave normal yields with treatments (a) and (b). In the third year (b) showed a satisfactory residual value with potatoes, whereas (a) showed none. It is not yet known which constituents of the sludge give it this superiority.

631.84 NITROGEN FERTILIZERS

(See also Abs. Nos. 1263, 1362)

[1210] 631.84 : 33
WATKINS, C. J. **World nitrogen situation.** *Agric. Chem.* 3, 1948 (24-27, 77-78).

A survey of the consumption of N with tabulated data for selected countries before, during and after the war. There are indications that N needs of the future will be greater than the present rate of consumption. In the United Kingdom, taking the pre-war consumption as a 100, the 1947-48 consumption was 277.

[1211] 631.842.4
WHITTAKER, C. W.; BROWN, B. E.; ADAMS, J. R. **Ammonium nitrate for crop production.** *U.S.D.A. Circ.* 771, 1948, pp. 28.

NH_4NO_3 is readily soluble in soil moisture and performs the functions of both $(NH_4)_2SO_4$ and $NaNO_3$. Its effect on soil reaction is

intermediate between that of $(\text{NH}_4)_2\text{SO}_4$ and NaNO_3 and it increases the salt content of the soil solution less than either of the other two. Yields of maize, potatoes, cotton and tobacco were very similar after applications of each of the three fertilizers.

631.85 PHOSPHATE FERTILIZERS

(See also Abs. Nos. 1091, 1105, 1367, 1383)

[1212] 631.85 : 631.416.2
IVERSEN, K. ; DORPH-PETERSEN, K. Forsøg med store Maengden Fosforsyre- og Kaligødning. Jordbundsanalyser og Markforsøg. 1940-1946. [Experiments with large quantities of phosphatic and potash fertilizers. Soil analyses and field experiments. 1940-1946.] *Tidsskr. Planteavl* 51 1948 (438-479). [D.a.e.]

A number of field trials were used as a measure of the reliability of laboratory methods of estimating available P and K. To ensure that the effect of P and K applications in amounts commonly used in agricultural practice would be tested on soils of widely different initial available-P and -K contents, heavy basal dressings at two levels were applied at the beginning, followed by subsequent annual dressings. The difference in amounts between basal and annual applications is illustrated by the values for super. that were 2000 and 4000 kg./ha. (1780 and 3560 lb./acre) as basal dressing and 100 and 200 kg./ha. as yearly applications. The yields throughout the rotation together with soil analyses are given. Available phosphate is defined as the amount of PO_4 dissolved by extracting a soil with nitric acid at a final pH of 2.5, and available potash is estimated as exchangeable K using NaCl. While the available-P value remained almost unaltered the available-K value fluctuated. On the other hand the increases in available K were proportional to the quantities of K applied to the soil and were very similar on the lighter soil types tested, but the increase in available P for a given application of P to the soil depended on soil type. If rock phosphate on an equivalent P_2O_5 basis were substituted for super. as initial basal dressing, the increases in yield from subsequent annual applications, of

super. were the same on the untreated as on the pretreated plot. Estimation of available K by soil analysis gave a satisfactory expression of the availability at the time of sampling. No detrimental effects from the heavy applications of super. were noticed. High concentrations of K caused toxic effects on some soils, and K should be applied in amounts according to the crop's requirements.—S.H.

[1213] 631.85 : 631.416.2
SPINKS, J. W. T. ; BARBER, S. A. Study of fertilizer uptake using radioactive phosphorus: II. *Sci. Agric.* 28, 1948 (79-87). [Univ. Saskatchewan]

The recovery of P fertilizer by a wheat crop used to be generally determined by a comparison of the uptake of P by fertilized and unfertilized crops. The extra P in the fertilized crop has been taken as the quantity coming from the fertilizer. Experiments with radio-phosphorus as a tracer show that the P in a phosphate fertilizer is utilized by wheat early in the growing season and that very little fertilizer P is used after the plant has reached the heading stage. The plant takes up fertilizer P more rapidly than soil P for the first four weeks of growth. After four weeks the plant takes up soil P much more rapidly. It is pointed out that there is a significant difference between the recovery of applied P as measured by the tracer method and by the difference in total P uptake between fertilized and unfertilized crops. After 8 weeks the actual amount of fertilizer P recovered, when measured by the tracer method, was 15.8% of the amount applied. Recovery measured by the difference between the total P uptake of the fertilized and unfertilized crops was 22%. The result obtained by the different method for the recovery of applied P would thus be in error by almost 40%.

[1214] 631.85 : 631.812
GUÉRIN, H. Evolution of the phosphate fertilizers industry. *Chim. Indust.* 59, 1948 (30-36). C.A. 42 (3519). [Fac. Sci., Nancy]

A review of developments, especially in the U.S., with a description of the preparation of metaphosphate and of the defluorination of natural phosphates.

631.86/7 ORGANIC FERTILIZERS

(See also Abs. Nos. 1166, 1275, 1278, 1311)

[1215] 631.86/7 : 551.577
DOMINICA DEPARTMENT OF AGRICULTURE.
The use of organic manures under heavy rainfall conditions. *Dominica Dept. Agric. Rept.* 1946 (23-24).

The effectiveness of fully rotted and unfermented pen manure, mulch + $(\text{NH}_4)_2\text{SO}_4$, and complete fertilizer was compared on sweet potatoes followed by maize. At a station receiving 64 inches of rain in 253 days, 10 tons/acre of fully rotted pen manure increased yield on the two successive crops. Unfermented plant material + $(\text{NH}_4)_2\text{SO}_4$ gave significant increase in the first crop but there was no residual effect on the second crop. Complete inorganic fertilizer accelerated vegetative growth of sweet potatoes but depressed the yield of tubers and there was no residual effect on the second crop.

At a station receiving 90 inches of rain in 276 days, both pen manure and complete fertilizer increased vegetative growth but gave no significant increase in tubers; there was a significant residual increase on the second crop. Neither unfermented pen manure nor grass cuttings + $(\text{NH}_4)_2\text{SO}_4$ gave immediate or residual results. Under rainfall of 90 inches in 276 days conditions are not favourable for fermentation, and fully rotted pen manure should be used. Where the rainfall is 64 inches in 253 days unfermented pen manure may be equally effective.

[1216] 631.86/7 : 631.81
MICHAEL, G. Untersuchungen über die Veränderungen eines leichten Sandbodens unter dem Einfluss von organischer und mineralischer Düngung. [Changes in a light sandy soil due to organic and mineral fertilizing.] *Ztschr. Pflanz. Düng.* 38, 1947 (239-249). [G.]

The rather acid soil was enclosed in 3 series of field cylinders, (a), (b), and (c), 75 cm. wide and 150 cm. deep. Each received NPK annually. Series (a) received no organic manure; (b) and (c) received, every second year, 300 dz./ha. of manure and an equivalent dry weight of straw respectively. Potatoes and cereal were grown alternately, and soil samples were analysed at the end of 9 years. The organic-matter and N contents of the soil, the degree of organic-matter decompo-

sition and of the production of stable humic acids, the water capacity, hygroscopicity and absorptive capacity for N and P were lowest in (a), rather higher in (c) and much higher in (b). pH values in (a), (b) and (c) were 4.0-5.9, 4.7-6.6 and 4.1-6.0 respectively.

[1217] 631.86 : 631.461.1/3
COPPENET, M.; DUCET, G. Transformation du fumier au cours d'une expérience pour la production du gaz de fumier. [Conversion of manure in the course of an experiment on the production of gas from manure.] *Ann. Agron.* 18, 1948 (33-38). [F.] [E.N.A. Grignon and Sta. Cent. Agron.]

Variations in the composition of manure during fermentation were studied over a period of 106 days. The vat used was provided with devices to maintain the temperature at 28-30°. A daily average of 524 l./ton of $\text{CH}_4 + \text{CO}_2$ was produced, this loss resulting in an increase in the percentage of ash of 22.0-34.4 on a dry-matter basis. The amounts present, expressed as percentages of organic matter, at the beginning and end of the period were:—total pentosans, 20.6 and 10.9; soluble pentosans, 13.9 and 6.98; N, 2.39 and 3.73; fatty material, 5.33 and 4.96; humic acid, 14.16 and 25.66; lignin + humin, 13.76 and 21.86; cellulose 29.56 and 15.40. These results suggest that the gases were produced by the decomposition of pentosans and cellulose, but that lignin does not play the part sometimes assigned to it.

[1218] 631.86 : 631.874
CARPENTER, R. W. Effect of organic amendments on crop yields at Mandan, North Dakota. *N. Dak. Agric. Expt. Sta. Bimo. Bull.* 10, 1948 (87-89).

Farmyard manure maintained the total N and C in the soil and increased yields much more than did green-manure crops.

[1219] 631.871 : 634.62
EMBLETON, T. W.; COOK, J. A. The fertilizer value of date leaf and fruit stalk prunings. *Date Growers' Inst., Indio, Rept.* 24, 1947 (18-19). C.A. 42 (3520). [U.S.D.A. Beltsville, Md.]

Date-palm leaves were found to contain 0.4-0.66% N, 0.025-0.062% P, 0.33-0.66% K with 10-16.4% of ash. The fruit stalks

contained 0.28-0.42% N, 0.017-0.04% P, 3.46-4.94% K and 7.7-9.88% ash. The prunings would probably supply more organic matter but less N than the average cover crop.

[1220] 631.874 : 631.417.4
PINCK, L. A. ; ALLISON, F. E. ; GADDY, V. L.
The effect of green manure crops of varying carbon-nitrogen ratios upon nitrogen availability and soil organic matter content. *J. Amer. Soc. Agron.* 40, 1948 (237-248). [Bur. Pl. Indust. U.S.D.A., Beltsville, Md.]

It is possible to utilize N to maintain soil organic matter at a high level. The extent to which the N exerts its effect depends primarily on the additional quantity of root and top residues produced and returned to the soil. Green-manure crops having a C/N ratio greater than 3.5 decreased yields and the percentage of added urea N recovered in the following crop. At ratios less than 3.5, some of the N of the green crop was available as well as that in the added fertilizer N. Where urea or NaNO_3 was added to 5 successive crops, the average recovery of N in the crop was 53%. Most of the remainder was only slowly made available when the soils remained fallow for several months. Cottonseed meal gave lower values. At any given level of total N (green crop + urea), green-manure crops increased soil C roughly in proportion to the quantity of C added, regardless of its source. All types of plant materials and N sources lowered the C/N ratio of the soil. At the end of the experiment, the uronic-carbon content of the soils varied as the total C varied and constituted about 31% of the total. Approximately 92-95% of the N added was accounted for in crops and soil.

[1221] 631.874 : 633.3-1.81
BONNET, J. A. ; TELFORD, E. A. ; MARIOTA, F., ET AL. **Effect of lime and phosphorus on the yield of four Leguminosae in two acid soils of Puerto Rico.** *J. Agric. Univ. P.R.* 29, No. 2, 1945 (47-56). [E.sp.]

The experiment aimed to settle to what extent leguminous green-manure crops on acid tropical soils benefited from the application of limestone + super. (4 tons/acre of limestone + 100 lb./acre of P_2O_5). Dry-weight yield per acre of velvet beans (*Stizolobium deeringianum*), cowpeas, soybeans and crotalaria (1) with and (2) without

the application were: (1) 22.5, 12.0, 8.7 and 7.7 cwt./acre and (2) 17.4, 10.0, 5.2 and 3.5 cwt./acre. The difference for cowpeas was not significant.

[1222] 631.875 : 631.812
RAJAN, S. V. G. **Improved methods of preparation of farmyard manure and farm composts.** *Mysore Agric. J.* 25, 1947 (63-66).

Methods of preparation in trenches and earth plastered heaps are described. The plastered heap is used where the water table is high. The addition of bone meal or charred bones to each layer of refuse is recommended.

[1223] 631.875 : 631.812
PIETTRE, M. Mise à l'ordre du jour du problème de l'humus naturel et des matières humiques artificielles. [Presentation of the problem of natural humus and artificial humic materials.] *C.R. Acad. Agric.* 34, 1948 (217-220). [F.]

In a discussion on the importance of humus in maintaining soil fertility, the need for organic matter in the cultivation of cereals in the Argentine and of coffee in Brazil is cited. Artificial manure has been prepared in France from straw, ferns and black peat, and in Brazil from vegetable debris such as woody grasses, maize straw, haricots, peat, etc. The need is stressed for controlled manufacture of artificial manures which in the past have been insufficiently fermented, while enrichment with urine, ammonium salts and blood should be encouraged where possible.

[1224] 631.877
SOWDEN, F. J. ; ATKINSON, H. J. **Waste sulphite liquor solids as a soil treatment.** *Sci. Agric.* 28, 1948 (175-182). [Sci. Serv., Dept. Agric. Ottawa]

Greenhouse investigations were carried out using materials prepared from an NH_4 -base cooking liquor by neutralizing with NH_4 , a Ca-base, NH_4 -neutralized liquor and a Ca-base, $\text{Ca}(\text{OH})_2$ -neutralized liquor. These waste-sulphite-liquor solids (W.S.L.S.) were compared with dried manure, W.S.L.S. + PK, NPK and two rates of PK. Yields of oat grains and plants were greatly increased by W.S.L.S. treatments, especially those including P and K, but not by dried manure.

The experiment was repeated with oats and lucerne and with additional treatments comprising N as urea, S as gypsum, S+N, S+NPK, W.S.L.S.+N and W.S.L.S.+NPK. Largest oat yields were obtained with NPK, followed by S+NPK and NPK+W.S.L.S. (Ca-base, $\text{Ca}(\text{OH})_2$ -neutralized), but this sample had an adverse effect alone. On sand there was a good response to N, that of urea being more available than that of W.S.L.S. especially of the NH_4 -base, NH_4 -neutralized liquor; PK significantly increased grain yield when applied with N or S+N, but not when given with W.S.L.S. On clay loam good response to N was only obtained when PK was also supplied and, again, urea N was more available than that of W.S.L.S. Lucerne yields were unaffected by W.S.L.S. on either soil, and both crops failed to respond to S.

[1225] 631.878
BOISCHOT, P.; BARBIER, G.; HÉBERT, J. Sur la valeur humique de la tourbe. [On the humic value of peat.] *C.R. Acad. Agric.* 34, 1948 (214-217). [F.]

The properties of peat make it suitable for use in potting soils and as litter, but it cannot be considered as a source of active humus. From attempts at Limburgerhof to improve the fertilizer value by treatment with acids and alkalis, it was concluded that the humic value of peat is not a function of its ability to liberate CO_2 , but of its "stabilized" humic-acid content. During incubation at 30°C . with and without mineral fertilizers no decomposition of peat took place and microbial activity was very reduced. Peat is used in Swiss fruit-tree culture, but only gives appreciable results when composted with CaCN_2 , slag or K_2SO_4 .

[1226] 631.878 : 631.86
ŚWIĘTOCHOWSKI, B. Przyczynę do poznania działania kompostów torfowych. [The effects of peat composts.] *Przeg. Doświad. Roln.* 3, 1947 (149-170). [Inst. Agric. Wrocław Univ.] [P.l.e.]

The effects of farmyard manure and peat compost were compared on sandy, podzolized and loess soils. 1 cu.m. of compost from lowland peat increased potato yields 14-88 kg. on sandy soil and 82 kg. on podzolized soil, and increased beet 158 kg. on loess. 1 cu. m. of peat compost had the same effect as 1.76 quintals of farmyard manure on sandy soil, 4.00 quintals on podzolized soil and

4.80 quintals on loess. Both peat compost and manure increased soil N and water-holding capacity. The effect of both was seen in oats and barley in the second year, in peas and oats in the third year and in rye in the fourth year after application. Increase in yield of potatoes after green-manuring with lupins was half that after farmyard manure; residual effect of green manure lasted into the fourth year.

[1227] 631.879.1/2
RAJAN, S. V. G. Manuring with town refuse compost. *Mysore Agric. J.* 25, 1947 (60-62).

Town-refuse compost contains 20-25% of humus, 1.0-1.5% of N and 1% of P_2O_5 . The usual application is 8 tons/acre for vegetables and irrigated food crops, 15-20 tons for sugar cane and 3-5 tons for dry-land crops grown under 20-30 inches rainfall.

[1228] 631.879.1/2 : 631.811.1
BOULD, C. Availability of nitrogen in composts prepared from waste materials. *Emp. J. Expt. Agric.* 16, 1948 (103-110). [Long Ashton Res. Sta., Bristol]

The perfusion method, fermentation method, pot experiments and rate of nitrification method were used in tests on straw-sludge and refuse-sludge composts and all indicate that the N in mature composts is not very readily available. This was confirmed by two field experiments in which yields were greater when inorganic N was used as well as composts. Availability of N in compost and farm manure was less than in sewage sludge and meat and bone meal, and was inadequate for maintaining maximum growth when applied on the same organic-matter basis as 10 tons/acre of farmyard manure. The loss of organic matter and N in mature composts can be 10-40%, depending on the conditions and duration of the process. When aerobic conditions are allowed to prevail in the compost heap, the high temperature and alkaline reaction result in heavy losses of ammonia.

[1229] 631.879.2
TRAVAINI, D. Agricultural uses of reclaimed sewage effluents—a discussion. *Sewage Works J.* 20, 1948 (33-35). C.A. 42 (3520).

The beneficial results from sewage effluents treated with FeSO_4 are discussed.

[1230] 631.879.3
NORTHEASTERN WOOD UTILIZATION COUNCIL.
Chipped wood as soil builder. *N-E. Wood Util. Counc. Wood Notes* 5, 1948 (3).

Field tests have been done in New Jersey with applications of basic calcium lignosulphonate and other lignins from pulping wastes. Lignin has no fertilizer value, but improves soil structure. Waste bark which contains a large percentage of lignin may be valuable as a soil builder. Cruder types of wood material are valuable on heavy soils, and soft gelatinous types of organic matter like lignin are useful for sands. Pine shavings tend to be toxic on heavy soils, but not on sands.

It is necessary to add nitrates to the soil or to compost the woody material before adding it to the soil, or to supplement the application with a leguminous crop. Fine chips may be used as cattle bedding and later applied to the soil with the addition of super.

631.89 MIXED AND COMPOUND FERTILIZERS

[1231] 631.893.12
PAAUW, F. VAN DER; MULDER, E. G.
[Fertilizing value of phosphate ammonium nitrate (Fas).] *Maandb. Landbouwwerlicht.* 4, 1947 (29-34). C.A. 42 (3520). [LandbProefsta. Bodemk. Inst. T.N.O., Groningen]

In this new fertilizer the filler CaCO_3 of the lime NH_4NO_3 (Kas) is replaced by 90% di-Ca phosphate and 10% $(\text{NH}_4)_3\text{PO}_4$. The fertilizer contains 20.5% N as NH_4NO_3 and is manufactured in grains of 1-5 mm.

632 PLANT DISEASES. WEEDS AND PESTS. PLANT PROTECTION

(See also Abs. Nos. 1106, 1261, 1274, 1323, 1325)

[1232] 632.III : 631.83
BEYLOT, R. Potasse et gelées d'hiver en 1947. [Potash and winter frosts in 1947.] *Potasse* 22, 1948 (93-94). [F.]

From observations on three plots of wheat given different fertilizer treatments it is concluded that the resistance shown by the wheat of a 50-acre plot to the severe frosts of 1947 is due solely to the application of 250 kg. of K_2O as sylvinite.

[1233] 632.191 : 631.811.1
NIGHTINGALE, G. T. The nitrogen nutrition of green plants. II. *Bot. Rev.* 14, 1948 (185-221). [Pineapple Res. Inst., Honolulu]

Effects of N and carbohydrate deficiency on various crops are discussed together with methods by which the plant may be used as a guide in N fertilization, using the carbohydrate content as the primary index.

[1234] 632.2 : 633.II-2.3
CHEO, C. C. A note on the relation of nematodes (*Tylenchus tritici*) to the development of the bacterial disease of wheat caused by *Bacterium tritici* *Ann. Appl. Biol.* 33, 1946 (446-449). [Nat. Tsing Hua Univ. China]

The bacterial disease of wheat caused by *Bact. tritici* could be induced by inoculating the seed with mixed bacteria and nematodes, but not with bacteria alone. Soil sterilization slightly increased the percentage of bacterial-disease infection, but did not affect development of the nematode disease. The fact that disinfecting the seeds did not affect percentage infection suggests that the bacteria are carried within the nematode galls.

[1235] 632.554.21 : 632.954
MITCHELL, J. W.; KEPHART, L. W. Effect of isopropyl phenylcarbamate on quackgrass stolons. *Greenkeepers' Repr.* 15, No. 4, 1947 (9-10). C.A. 42 (3521). [U.S.D.A. Beltsville, Md.]

In greenhouse tests, grasses were killed in 3-4 weeks after treatment with IPC at rates of 5, 15, 30 and 60 lb./acre. In the field, $\frac{1}{3}$ of the established plants were unaffected by application of 5 lb./acre; all plants were killed after 6 weeks with 10 lb./acre. Caution should be used where later grass crops are to be grown and near broad-leaved crops.

[1236] 632.567.51
KOBLET, R. Über das Auftreten und die Bekämpfung des scharfen Hahnenfusses in ostschweizerischen Dauerwiesen. [The occurrence and control of crowfoot in permanent pastures in the east of Switzerland.] *Landw. Jahrb. Schweiz.* 60, 1946 (427-476). Herb. Abs. 18 (102). [Eidg. Landw. Versuchsanst. Zürich Oerlikon]

Ranunculus stevenii is a prevalent weed in grasslands in eastern Switzerland. There appears to be no relationship between its abundance and the physical and chemical

conditions of the soil such as air- and water-holding capacity, pH and lime content. Replacement of farm manure by mineral amendments, particularly P_2O_5 and K_2O , reduced *R. stevenii* and other weeds and improved grasses and legumes.

[1237] 632.576.5 : 632.954
MINSHALL, W. H. **Eradication of poison ivy (*Rhus radicans* L.). III. Further preliminary results with 2,4-dichlorophenoxyacetic acid formulations, ammonium sulfamate, and sodium chlorate.** *Sci. Agric.* 28, 1948 (140-141). [Dominion Dept. Agric. Ottawa.]

Of the 2,4-D formulations, the Me ester gave the best control followed by the acid, the ammonium salt and the triethanolamine salt in order of decreasing efficiency. Control with the methyl ester was equal to that with 10% ammonium sulfamate and better than that with 10% $NaClO_3$.

[1238] 632.594.2
SHERWOOD, L. V.; FUELLEMAN, R. F. **Experiments in eradicating field bindweed.** *Ill. Agric. Expt. Sta. Bull.* 525, 1948, pp. 506.

Field bindweed can be eradicated in 1½-2 growing seasons by bare fallow or by clean cultivation of an intertilled crop like maize. After the roots have been eradicated it is advisable to grow intertilled crops for at least another year to get rid of all seeds in the soil. 2,4-D and chlorates are effective and are recommended where cultural equipment cannot be used.

[1239] 632.7 : 632.954
VELLOSO, J. F. Método prático para extinção de formigueiros. [Practical method of destroying anthills.] *Bol. Agric. S. Paulo* 44a, 1943 (307-313). *Herb. Abs.* 18 (85).

A simple method is described and illustrated of applying a formicide by means of a bore to the underground tunnels of *Atta sexdens*.

632.95 FUNGICIDES. INSECTICIDES. HERBICIDES

(See also Abs. Nos. 1267, 1348, 1365)

[1240] 632.951
WALLACE, C. R. **Small-scale tests with D.D.T. and benzene hexachloride incorporated in the soil.** *J. Aust. Inst. Agric. Sci.* 13, 1947 (132-137). [N.S.W. Dept. Agric.]

In experiments with potted maize it was found that soil mixed with suitable quantities of DDT or benzene hexachloride protected plants from soil pests. DDT at 3 oz./cu. ft. of soil had no ill effect on germinating maize and protected young maize from black beetle. 3 oz./cu. ft. of benzene hexachloride prevented normal germination; ½-1 oz. applied to young maize protected the plants from black beetle, but caused severe injury to the plants.

[1241] 632.951.22
FREMouw, C. A. **[Disinfecting the soil with carbon disulphide.]** *Tijdschr. PlZiekt.* 53, 1947 (13-16). *Hort. Abs.* 18 (36). [Du.]

A method is described in detail and the advantages and drawbacks are discussed.

[1242] 632.953 : 631.461.52
HENRY, A. W. **Newer chemical seed treatments for peas.** *Pr. Bull. Univ. Alberta* 32, 1947 (4-5). *R.A.M.* 27 (213).

Treatment of pea seeds with spergon, arasan and ceresan increased percentage emergence and yields, but as these chemicals are liable to kill legume bacteria on inoculated seeds it is recommended either that the bacteria be applied to the soil at sowing time or that inoculation be delayed until after seed treatment and four hours before sowing.

[1243] 632.954
HAVIS, J. R.; SWEET, R. D. **The value of certain aromatic naphthas and growth regulators as soil treatments for weed control in vegetables.** *Proc. Amer. Soc. Hort. Sci.* 49, 1947 (325-331). [Cornell Univ., Ithaca, N.Y.]

Three growth regulators (A) 2,4-D in the form of a 75% soluble ammonium salt, (B) the methyl ester of alpha-naphthalene-acetic acid and (C) thiourea in the form of a soluble salt, and 3 aromatic naphthas were applied to a potentially weedy soil. (A) and (B) were equally effective in controlling weeds when applied to the soil at 7.5 lb./acre before weeds had appeared above ground, but (B) was less injurious to crops. (C) controlled weeds and was not toxic to maize or beans. The aromatic naphthas which were applied at 150 gallons/acre were unsatisfactory for weed control when applied to the soil before weeds had emerged, but

post-emergence treatment gave excellent control. Crops were injured only when conditions were unfavourable for rapid evaporation. Beans were adversely affected if planted less than 16 days after the application of 2,4-D.

[1244] 632.954 : 577.17
HOLMES, E. **Plant hormones with special reference to selective weed killers.** *Chem. Indust.* 1948 (355-359).

An outline of the history and uses of Methoxone and 2,4-D.

[1245] 632.954 : 577.17 : 631.43
BROWN, J. W.; MITCHELL, J. W. **Inactivation of 2,4-dichlorophenoxyacetic acid in soil as affected by soil moisture, temperature, the addition of manure, and autoclaving.** *Bot. Gaz.* 109, 1948 (314-323). [Bur. Pl. Indust. U.S.D.A., Beltsville, Md.]

Soil moisture, temperature and organic-matter content influence the rate of 2,4-D inactivation indirectly, possibly through their effect on growth of soil micro-organisms. The rate of inactivation was most rapid at a moisture content of 30% and a temperature of 70°F. Toxic effects will probably persist in arid regions and during prolonged spells of cold weather. 2,4-D mixed with the soil was inactivated more quickly than when applied to the surface. Applications of manure to soil low in organic matter hastened the inactivation of 2,4-D, but autoclaving slowed down the inactivation.

[1246] 632.954 : 577.17 : 631.43
JORGENSEN, C. J. C.; HAMNER, C. L. **Weed control in soils with 2,4-dichlorophenoxyacetic acid and related compounds and their residual effects under varying environmental conditions.** *Bot. Gaz.* 109, 1948 (324-333). [Mich. St. Coll., E. Lansing]

Application to sandy orchard soil of 2 p.p.m. of the Na salt of 2,4-D killed 95-98% of all weed seed present in the soil. There was no appreciable difference in the effect of the acid, the Na salt or the methyl ester, although the methyl ester permitted plantings a little sooner than either of the others. The 3 compounds were equally effective at 8 p.p.m. in sand and permitted normal plantings within 5 weeks. On muck soils 8 p.p.m. of the Na salt was ineffective in killing weed seeds.

The disappearance of toxicity of the Na salt was rapid under high soil-moisture conditions, and was more rapid at 50° and 80°F. than at 36° and 0°F. The compound was equally effective under all temperatures. Differences in the pH of the soil did not affect the rate of loss of toxicity. In water-saturated soils the Na salt disappeared in 3 weeks but air-dry soils were toxic after 8 weeks.

[1247] 632.954 : 577.17 : 631.453
WEAVER, R. J. **Contratoxification of plant growth-regulators in soils and on plants.** *Bot. Gaz.* 109, 1948 (276-300). [Hull. Bot. Lab., Univ. Chicago]

Contratoxification refers to the application of adsorbants, adsorbants or ion exchangers to soils or parts of plants so as to eliminate the toxic effects on plants of plant-growth regulators. 2,4-D, the butyl ester (BE 2,4-D), the copper salt (Cu (2,4-D)₂), 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and *o*-isopropyl N-phenylcarbamate (IPPC) were added to a silt loam at concentrations of 22 and 220 p.p.m. IPPC was least persistent, and much of its toxicity had disappeared after 2 days' storage. Soil to which 220 p.p.m. of 2,4,5-T was added was still toxic after 15 months. Soil to which 22 p.p.m. of the Cu salt, 2,4-D and BE had been added showed little toxicity after 11 months, and that which had received 220 p.p.m. had lost its toxicity after 15 months.

The same compounds were added to soil at rates equivalent to 7.4 lb./acre of 2,4-D, and Sudan grass, beans, white mustard and soybeans were planted successively. 2,4,5-T was the least toxic and persistent and BE 2,4-D the most persistent. Soils were toxic 45 days after application. 2,4,5-T was least satisfactory for weed control, the Cu salt and 2,4-D had fair control and BE 2,4-D had excellent control. Spading or ploughing decreased toxicity in a field soil contaminated with 2,4-D. Only the upper 3 inches of soil were toxic to plants after the application of 10-25 lb./acre of 2,4-D, even after heavy rains.

The application of a cation exchanger, or an adsorbant (activated charcoal) to soil containing 2,4-D or to soil before treatment with 2,4-D, resulted in decrease or complete elimination of toxicity. Super filtrol and attapulugus clays were ineffective as contra-toxicants. Lamp black and bone black were

partially effective. The addition of a wetting agent to suspensions of contratoxicants often decreased or eliminated their effectiveness. Protection to beans was slight unless the contratoxicant was applied within 15 minutes after treatment with the growth regulator.

[1248] 632.954.8
JOHANNSON, TH. Natriumkloratet i ugraskampens praksis. [Control of weeds with sodium chlorate in practical agriculture.] *Norsk Landbr.* 13, 1947 (453). Herb. Abs. 18 (102).

At the end of July 1946, NaClO_3 was applied at 35 kg./1000 sq. m. to a weedy third-year ley. In 1947 all weeds except a few plants of couch grass had disappeared and the yield of potatoes grown was 330 kg./1000 sq. m. larger than on potato fields elsewhere.

633.1 CEREALS

(See also Abs. No. 1378)

[1249] 633.1-1.4 : 577.16
MCELROY, L. W.; KASTELIC, J.; MCCALLA, A. G. Thiamine and riboflavin content of wheat, barley, and oats grown in different soil zones in Alberta. *Canad. J. Res.* 26F, 1948 (191-200). [Univ. Alberta, Edmonton]

The mean thiamine content of all three grains was highest in samples grown on brown soils and lowest in those grown on grey soils. In wheat and oats riboflavin levels were slightly lower in samples grown on grey soils than in those grown on black and brown soils.

[1250] 633.1-1.4 : 577.16
MCELROY, L. W.; SIMONSON, H. The niacin content of wheat, barley, and oats grown in different soil zones in Alberta. *Canad. J. Res.* 26F, 1948 (201-207). [Dept. Animal Sci., Univ. Alberta, Edmonton]

Microbiological assays on wheat, barley and oats grown on black, grey and brown soils gave no indication that the type of soil had any marked effect on the accumulation of niacin.

[1251] 633.1-1.81
BARBACKI, S.; SALONI, K. Reakcja odmian zbóż na nawożenie i ilość wysiewu.

[Response of cereal varieties to manuring and rate of sowing.] *Przeg. Doświad. Roln.* 3, 1947 (56-76). [Pl.e.] [Agric. Expt. Inst. Univ. Poznań]

On a humous loess soil five varieties of winter wheat were tested in randomized blocks during the three seasons 1935-38, and three varieties of spring wheat, four of barley and four of oats during the seasons 1937-39. The straw and grain yields were submitted to a modified analysis of variance.

Winter wheat was sown at one rate and subjected to 8 manurial treatments. The other cereals were sown at two rates and the manurial treatments were NPK and control. For all four cereals the effect of season on yield was in general much greater than any effect of manuring or variety: this was especially true of oats. The higher rate of sowing increased the unmanured yield of the spring cereals, and NPK gave a further similar increase: these increases were, however, small and almost independent of variety. Winter wheat showed varietal differences most markedly after the severe winter 1936-37, to which the variety Graniatka Dańkowska (*Triticum vulgare* var. *albidum*), stood up best, being one of the heaviest yielders in other seasons. In 1936-37 it gave the best yield of grain both when unmanured and with NPK. In 1936-37 yields of straw of all varieties were greatly increased by complete manuring. In 1937-38, after a normal winter, the highest yields of grain and straw were on plots receiving N only, the other yields of winter wheat were substantially similar and independent of treatment and variety.—R.N.

[1252] 633.1-2.4-1.58
TYNER, L. E. Effect of crop debris, plant roots, and crop sequence on the microbial flora of the soil in relation to root rot in cereal crops. *Canad. J. Res.* 26C, 1948 (86-93). [Sci. Serv. Dept. Agric. Ottawa]

Finely chopped straw of wheat, oats or barley was mixed with black soil to make 3% by weight of each mixture. Moisture content was kept at 20%, and the mixture sampled every 3 weeks to examine the microflora. Straw increased the numbers of micro-organisms in the soil. The numbers of bacteria were unaffected by the kind of straw, but fungal colonies were most numerous in oat-straw composts. In a series of pot experiments black loam in fallow and

soil heavily infested with *Helminthosporium sativum*, *Ophiobolus graminis* and *Fusarium* spp. were planted in the rotations: wheat-wheat-wheat, oats-wheat-wheat, oats-oats-wheat, oats-oats-oats, and in rotations in which barley and beans bore the same relation to wheat as the oats. Fungus counts were very high in the rhizosphere of wheat plants in root-rot soil and numerous in that of wheat following oats, but did not show marked increases after barley or beans. Disease rating varied directly with trends in fungus counts, and it is suggested that the pathogens pave the way for other fungi by providing rotted root tissue as food. The colonies included 64% *Mucor* spp. and 29% *Penicillium* spp. while organisms pathogenic to oats, barley or beans seemed to be absent. Fungus counts were not high on fallow soil and decreased with successive plantings. Micro-organisms were always more abundant in the rhizospheres than in the soil controls.

[1253] 633.11-2.4-1.811
GARRETT, S. D. **Soil conditions and the take-all disease of wheat. IX. Interaction between host plant nutrition, disease escape, and disease resistance.** *Ann. Appl. Biol.* 35, 1948 (14-17). [Rothamsted]

In a field experiment, the disease rating of the roots of barley plants suffering from 'take-all' was reduced by application of N, and by a combined dressing of P and K. This reduction is attributed to the fact that manuring enables the cereal plant to produce new crown roots more quickly than *Ophiobolus graminis* can infect them. In an earlier pot-culture experiment, operation of this disease-escape mechanism was inadvertently reduced by inoculating plants at the crown, and by environmental conditions exceptionally favourable to infection (sand culture and relatively high temperatures in the glass-house). Under these conditions, not only was root-disease rating as high in the series receiving a full supply of nutrients (NPK) as in that receiving only one-third the full amount, but it was reduced almost to one-half in the series receiving one-third N in the presence of full P and K ($PK\frac{1}{3}N$). It is concluded that an increase in N supply may increase the intrinsic susceptibility of individual roots to infection, at the same time as it promotes disease escape and increases yield of the whole plant.—Author's summary.

[1254] 633.14-1.53
INSTITUT FÜR ACKER- UND PFLANZENBAU DER UNIVERSITÄT BERLIN. Über die Ertragsleistung des Winterroggens bei Tiefumpflanzung. [The yield of transplanted winter rye.] *Ztschr. Pflanz. Düng.* 39, 1947 (114-125). [G.]

On a loamy sand soil, transplanted winter rye always yielded less grain and straw per hectare than drilled rye, whatever the conditions of spacing and fertilizing.

[1255] 633.14-1.84
OPITZ, K. Über Saatstärke und Stickstoffdüngung des Roggens. [Seeding rates and nitrogen fertilizing of rye.] *Neue Mitt. Landw.* 1946 (44). *Ztschr. Pflanz. Düng.* 38, 1947 (183). [G.]

On a sandy soil poor in chalk and humus, rye was sown at rates of 80-160 kg./ha. and fertilized with N at rates of 0-80 kg./ha. There was very little difference in grain yield due to seeding rates, whereas the fertilizing caused increases of up to 13 dz./ha. Splitting the N application (20 kg. in autumn and 60 kg. in spring) gave no advantage.

[1256] 633.14-1.84
BADISCHE ANILIN- UND SODAFABRIK, LANDWIRTSCHAFTLICHE ABTEILUNG. Was leistet der Stickstoff im Roggenbau? [The effect of nitrogen in rye cultivation.] *Ztschr. Pflanz. Düng.* 29, 1947 (137-159). [G.] [Ludwigshafen]

The results of 1367 field experiments covering 4-14 years in all parts of Germany. 69% of the experiments were on light, 22% on medium and 7% on heavy soils. 32% of the soils were of pH < 5.5, 39% were weakly acid and 29% neutral or weakly alkaline. 55% of the rye crops followed cereals; 27% hoed crops; 8% legumes. 11% received farmyard manure and 1% received green manure. In 60% of the experiments PK was applied in autumn, usually at sowing; otherwise it was given in early spring. The average rates were: 40-45 kg./ha. of P_2O_5 and 70-75 kg./ha. of K_2O . The average grain and straw yields with PK were 18.2 and 40.4 dz./ha. N, at 30-60 kg./ha., was usually applied in spring, and gave increases in grain yield of 5.7 and 9.6 dz./ha., respectively, above the basal PK dressing. 40 and 60 kg./ha. of N

increased straw yields by 15.3 and 20.3 dz./ha. The effect of 1 kg. of N was greatest with the 40 kg./ha. application, both for grain and straw.

It is concluded that 40 kg./ha. of N may be used on any soil, but that 60-kg. applications should be confined to light soils. The effectiveness of unit weight of N was slightly less where Ca deficiency was greater, and was slightly greater after hoed crops than after legumes, but remained satisfactorily high whatever the previous crop. In years favourable to rye, N increased grain yields by 26% and in unfavourable by 32%, and thus tended to steady the yield fluctuations. Lodging occurred independently of N in 6.4% of the experiments, occurred with NPK fertilizing in 11.4%, was unaffected by the preceding crop and was less frequent on the lighter than on the other soils. While lodging increased with increasing N applications, the effectiveness of unit weight of N always remained satisfactory.

[1257] 633.14-1.84-1.547.2
REINDERS, D. E. Veredelingsonderzoekingen met rogge. II. De invloed van de bemesting op de uitstoeiing. [Rye-breeding investigation. II. Influence of fertilizing on tillering.] *Landbouwk. Tijdschr.* 56 1944 (9-13). *Biol. Abs.* 22 (167). [Du.]

Heavy applications of N are recommended to increase tillering. P and K seemed to have no appreciable influence.

[1258] 633.15-1.531
BĂLAN, I. M. Resultatele experimentelor cu metoda Lister la porumb, obținute în anii 1933-1945 la Stațiunea Experimentală Agricolă a Bărganului. [Results of experiments on the application of the Lister method to maize during the period 1933-1945 at the Bărgan Experimental Station.] *An. Inst. Cerc. Agron. Român.* 18, 1946, 1947 (162-189). [Rm.f.]

Application of the Lister method to the cultivation of maize over a period of years has given negative results and the method is not recommended as a means of controlling drought conditions or increasing yields.

[1259] 633.15-1.816.3
AMERICAN FERTILIZER. Increasing fertilizer increases Indiana corn yields. *Amer. Fert.* 108, No. 6, 1948 (22).

7 years' experiments show that fertilizer on maize is most efficient when applied in bands by the hill. Broadcasting fertilizer on the surface is the least efficient method. Applications larger than 150 lb. in the hill or 250 lb. in the row should be ploughed under or placed in bands on the plough sole. Fertilizer for ploughing under on upland soils should be high in N.

[1260] 633.15-2.954:577.17
ANDERSON, J. C.; DALE, E. W. Pre-emergence control of weeds in corn with 2,4-D. *J. Amer. Soc. Agron.* 40, 1948 (453-458).

The Na salt of 2,4-D was applied at the rate of 1½-3½ lb./acre of the free acid (a) at planting and (b) 8 days after planting. Treatment (b) gave better weed control and was less harmful to the stand than (a). The percentage of seedling emergence decreased with an increase in rates of application.

[1261] 633.17-2.595.16
ANDREWS, F. W. The parasitism of *Striga hermonthica* Benth. on sorghum spp. under irrigation. I. Preliminary results and the effect of heavy and light irrigation on *Striga* attack. *Ann. Appl. Biol.* 32, 1945 (193-200). [Dept. Agric., Wad Medani, Sudan]

As land becomes infertile owing to continuous cropping with sorghum, infestation with *Striga hermonthica* becomes increasingly severe. Application of (NH₄)₂SO₄ to irrigated sorghum decreases *Striga* attack. Light irrigation during the sowing period increased *Striga* attack and heavy irrigation decreased it. When micro-elements were coated on sorghum seeds before sowing there was no reduction in *Striga* attack. Most *Striga* seeds can only be germinated by excretions from roots of certain plants not all of which can act as hosts for the parasite. Unless it becomes attached to a host plant the *Striga* seedling dies. Germination of *Striga* seed by a non-parasitized leguminous crop may be a means of ridding the land of the parasite.

[1262] 633.18-1.416
ADACHI, M. Applied microbiological studies on rice fields. I. Nature of paddies during the cultivation of rice plants. *J. Soc. Trop. Agric. Taiwan* 14, 1942 (254-290). *C.A.* 42 (2706).

In rice fields the pH and NH_4 content are always higher and the SO_3 and NO_3 contents are lower in the water than in the underlying soil. The amount of SO_3 in the soil does not change with depth. The top soil contains more NO_3 and less NH_4 and total N than deeper layers.

[1263] 633.18-1.67-1.841.8
DIJK, J. W. VAN. **Experiments on the use of ammonia in irrigation water applied to rice.** *Meded. Alg. Proefsta. Landbouw* 70, 1948, pp. 18. [E.] [Inst. Soil Res., Buitenzorg, Java]

NH_3 dissolved in irrigation water gave an increased yield of rice, but losses of NH_3 by evaporation were high while the plots were under water, reaching 66% in laboratory experiments. 24% of a concentration of 110 mg./l. of NH_3 was adsorbed through the walls of an earthen conduit 250 m. long. The extra yields were smaller and more uncertain than those given by equivalent $(\text{NH}_4)_2\text{SO}_4$.

NH_3 also injured the fish fauna.

[1264] 633.18-1.81
CHANG, S. C.; LIN, J. F.; PUH, Y. S. [The effect of continuous application of the same fertilizer on the yield of rice and the physical and chemical properties of soil.] *Taiwan Agric. Res. Inst. Tech. Bull.* 3, 1947 (18-43). [Ch.e.]

The results of field experiments in which rice was grown for 24 years with 12 different fertilizer treatments show that continuous application of $(\text{NH}_4)_2\text{SO}_4$ gives a fairly good yield for the first few years but later causes deterioration of fertility and a decline in yield. Super. increased yields of grain but not of straw, while K did not affect yields. Stable manure and, to a lesser degree, soybean cake maintained soil fertility and was more effective for the later than the early crop. Green manure gave the highest yield during the first few years but this effect was not permanent. A complete inorganic fertilizer was inferior to green manure but with the addition of lime the yield was greatly increased. The various treatments did not affect mechanical composition.

[1265] 633.18-1.81
CHEN, C. T.; LIN, J. F. [A discussion on the results of thirty years' experiment of growing rice without applying fertilizer.] *Taiwan Agric. Res. Inst. Tech. Bull.* 3, 1947 (1-17). [Ch.e.]

Rice was grown continuously without fertilizer from 1911 to 1946 in cement tanks with the dimensions $0.9 \times 0.9 \times 0.7$ cu. m. in accordance with local methods of cultivation. Yields and uptake of plant nutrients diminished in the course of years; the ratio of $\text{N} : \text{P}_2\text{O}_5 : \text{K}_2\text{O}$ absorbed by the crop was nearly the same for successive years, the largest variation being shown by K_2O . The mechanical and chemical compositions of the soils were compared with those of soils from adjacent fertilized tanks. Results are tabulated, also the coefficient of correlation and the corresponding "t" value of the yield, dry matter, percentage of N, P_2O_5 and K_2O and content of N, P_2O_5 and K_2O of grain and straw.

[1266] 633.18-2.4
DAS, C. R.; BARUAH, H. K. **Experimental studies on the parasitism of rice by *Helminthosporium oryzae* Breda de Haan and its control in field and storage.** *Trans. Bose Res. Inst.* 1944-1946, 16, 1947 (31-46). R.A.M. 27 (294-295).

In soil-inoculation experiments the number of plants infected by *Helminthosporium oryzae* (*Ophiobolus miyabeanus*) was higher in water-logged than in natural soil. Encouraging results were obtained by seed treatment with 0.05-1% diphenyl and by storage in diphenyl-impregnated gunny bags. Other control methods include deep irrigation to remove the sources of infection in the soil, burning diseased grasses and other refuse and the use of resistant varieties.

633.2/3 GRASSES. LEGUMES

[1267] 633.2-2.954 : 577.17
PRIDHAM, A. M. S. **Effect of 2,4-D applied at the time of seed germination in reducing stands of annual grasses.** *Greenkeepers' Rept.* 15, No. 4, 1947 (11-13). C.A. 42 (3521). [Cornell Univ.]

Application of 5 lb./acre of the amine of 2,4-D reduced stands of annual grasses, severely injured white clover and did not permanently affect common lawn grasses. Preliminary soaking of seeds in solutions up to 1000 p.p.m. did not completely prevent germination of oats. Comparative data are given for NH_4CNS , Me ester of 2,4-D, Na_3AsO_3 , Stantox (amine of 2,4-D), Ammate (NH_4 sulfamate) and CaCN_2 .

[1268] 633.2.03-1.589
KILLINGER, G. B. **Effect of burning and fertilization of wire grass on pasture establishment.** *J. Amer. Soc. Agron.* 40, 1948 (381-384).

Wire grass, *Aristida stricta*, is predominant over millions of acres of cutover pineland in Florida. Burning in the wet season (June to August) retards growth for 1-2 years whereas burning at other times stimulates growth and greatly increases the content of N, P, K, Mg and Ca. 600 lb./acre of 4-8-4 fertilizer + 2000 lb. of lime applied to unburned grass increased the N and mineral contents of the new growth by over 50%. Cu, Mn, Zn and B had little effect on grass composition. Fertilized burned plots gave the highest increases in N and mineral contents of grass analysed 211 days after treatment.

[1269] 633.2.03-1.81 : 636.084.22 : 581.192
WEINMANN, H. **Effects of grazing intensity and fertilizer treatment on Transvaal highveld.** *Emp. J. Expt. Agric.* 16, 1948 (111-118). [Dept. Agric. S. Rhodesia]

Heavy grazing diminished the beneficial effects of fertilizers on growth, and maximum nutrient yields were obtained from moderately grazed, fertilized veld. Under both heavy and moderate grazing, fertilizers increased protein and P and K contents of herbage. Other constituents were generally little influenced by fertilizers except total ash, which was higher in herbage from unfertilized plots. Unfertilized younger herbage from more frequently grazed plots contained more protein and total ash than from moderately grazed veld. The effect of fertilizers on root weight and on total available carbohydrate in roots was only slight. Roots from fertilized plots were significantly higher in N and P than those from unfertilized plots. Differences in K content were not significant. Fertilizers significantly increased the growth of weeds.

[1270] 633.2.03-1.84 : 581.192
HALL, T. D. ; MEREDITH, D. ; MURRAY, S. M. **Dry matter and protein of pastures as affected by amounts and forms of nitrogen applied.** *S. Afric. J. Sci.* 44, 1948 (111-118). [Afric. Explosives and Chem. Indust. Ltd.]

On *Cynodon dactylon*, a compost dressing containing 200 lb./morgen of N + phosphate was compared with two treatments of

$(\text{NH}_4)_2\text{SO}_4$ + phosphate containing 89 and 445 lb./morgen of N respectively. N in the organic form gave 8.4 lb. of dry matter per lb. of N applied; the inorganic treatments gave 42.7 and 27.3 lb. respectively. Recoveries of N in the herbage was 15.4% for compost treatment, 66.6% for low inorganic-N treatment and 50.5% for high inorganic-N. Increase in both top growth and root weights were greater with inorganic N than with compost.

On Rhodes grass and *Paspalum dilatatum* mixture, 3 levels of inorganic-N treatments were compared. 112 lb. /morgen of N as $(\text{NH}_4)_2\text{SO}_4$ applied in one dressing gave an average return of 38.5 lb. of dry matter per lb. of N applied and the percentage recovery of N was 51.1%; 224 lb./morgen in 2 dressings gave 27.0 lb. of dry matter and 38.5% recovery; 448 lb. of N in 2 dressings gave 23.2 lb. of dry matter and 46% recovery.

On this soil type it was not possible to obtain herbage with more than 10.13% of crude protein. The effect of N fertilizers was to increase dry-matter production rather than crude-protein content.

[1271] 633.31-1.434
STAUFFER, R. S. **Legumes improve drainage and reduce erosion.** *Better Crops* 32, 1948 (6-8, 47-50).

A heavy clay on nearly level topography gave little response to fertilizers. With a rotation of maize, oats, lucerne-bromegrass (2 years) aggregation increased to 54% from 23% and yield to 68 bu./acre from 26 bu./acre under continuous maize.

[1272] 633.374 : 581.192.6
AYERS, A. D. **Salt tolerance of birdsfoot trefoil.** *J. Amer. Soc. Agron.* 40, 1948 (331-334). [U.S. Reg. Salin. Lab., Riverside Calif.]

Lotus corniculatus var. *tennuiifolius* has a high salt tolerance and can stand high summer temperatures.

[1273] 633.375-1.461.52
ERDMAN, L. W. **Strains of Rhizobium effective on guar, *Cyamopsis tetragonoloba*.** *J. Amer. Soc. Agron.* 40, 1948 (364-369).

In greenhouse studies two strains of Rhizobium, one from *Crotalaria sagittalis* and the other from *Erythrina indica*, were highly

effective in promoting vegetative growth and N fixation in guar plants. Strains of *Rhizobium* isolated from guar, kudzu, alcyce clover and *Indigofera* produced good nodulation and some N fixation but were not good enough for preparing inoculants for guar. Two strains, one isolated from *Lespedeza stipulacea* and the other from *Dalea alopecuroides* were parasitic on guar.

633.4 ROOT CROPS

[1274] 633.41-2.4 : 551.58
WENZL, H. Die Cercospora-Gefährdung der Rübenbauggebiete Deutschlands. Ein Beitrag zur Darstellung der Abhängigkeit der Pilzkrankheiten von den Klimaverhältnissen. [The liability to *Cercospora* of the beet-growing regions of Germany. A contribution to the account of the dependence of fungus diseases on climatic conditions.] *Arb. Biol. Anst. (Reichsanst.) Berl.* 23, 1940 [?] 265-272. R.A.M. 27 (212).

The pathogenicity of beet leaf spot (*Cercospora beticola*) depends on appropriate humidity and temperature conditions. The liability to leaf-spot outbreaks in the different regions of Germany may be predicted by considering the monthly mean temperatures and precipitation from May to September which is the critical infection period.

[1275] 633.42-1.862
BAYERISCHE LANDESANSTALT FÜR PFLANZENBAU UND PFLANZENSCHUTZ. Über die Düngewirkung der Jauche bei Winter- und Sommerraps (Körnerraps). [The manurial effect of liquid farm manure on winter and summer rape seed.] *Ztschr. Pflanz. Düng.* 38, 1947 (167-179). [G.]

On loamy sands, poor in N, single dressings of medium-strength liquid manure at about 200 hl./ha. were as effective as equivalent $(\text{NH}_4)_2\text{SO}_4$ in increasing the yields of grain and straw. Pouring the liquid between the rows was as satisfactory as pouring into prepared furrows and immediately covering, but this unexpected N conservation was probably due to conditions which would not normally occur together on farms, namely the uniformity and carefulness of application, the rapid absorption by a well cultivated loose soil free from weeds, the dilution by stall water to a N content of 0.2-0.3%, etc.

Normally, if manure drills adjusted for rape seed are lacking, the liquid should be applied, before sowing or planting, to hoed crops, summer catch crops, etc., when it can be cultivated into the soil. It gave small increments after peas, and is most economically used on fields where K and especially N are low. Summer rape tolerated 400, and winter rape 600 hl./ha., but, to prevent luxury intake of K and a possible unbalance of soil nutrients, liquid manure of medium strength should not be applied at more than about 200 hl./ha., and any further requirement of P and N should be met by mineral fertilizing. The best time of application has not been settled, but with winter rape it should be near the start of growth. With summer rape, 4-6 weeks after sowing was satisfactory.

[1276] 633.42-2.191 : 546.27
CANADA DEPARTMENT OF AGRICULTURE, SCIENCE SERVICE. [Brown-heart in turnips.] *Canada Dept. Agric. Sci. Serv. Rept.* 1946-1947, 1947 (74).

In soils in which brown-heart of turnips occurred, water-soluble B content was fairly uniform and averaged 0.44 p.p.m., and pH was 5.5-7.0. Applications of 15 lb./acre and 45 lb./acre of borax resulted in increase in B content of the leaves and decrease in the occurrence of brown-heart, but 45 lb./acre was not sufficient to give complete control of the disease.

[1277] 633.42-2.191 : 546.27
MACLACHLAN, J. D.; STRONG, W. F. Spraying and dusting turnips to prevent water core, a disorder caused by boron deficiency. *Sci. Agric.* 28, 1948 (61-65). [Ontario Agric. Coll. Guelph]

Where equipment for foliage application of borax is unavailable, a side dressing of 20-30 lb./acre after thinning is recommended for the prevention of water core and brown heart in turnips.

633.491 POTATOES

(See also Abs. Nos. 1090, 1204, 1308)

[1278] 633.491-1.411.2-1.86
DROUINEAU, G.; GOUNY, P.; LEFÈVRE, G. Influence des fumures organiques en sol calcaire sur le rendement et la nutrition minérale de la pomme de terre de primeur.

[Effect of organic manure on the yield and mineral nutrition of early potatoes on calcareous soils.] *C.R. Acad. Agric.* 34, 1948 (273-275). [F.]

N, P and K were applied to a calcareous soil as sheep manure and as $(\text{NH}_4)_2\text{SO}_4 + \text{super.} + \text{K}_2\text{SO}_4$ at rates of 2.96, 1.60 and 2.72 kg./acre respectively. The yield of potatoes from the manure-treated plots was 134 kg. compared with 102 kg. from those receiving mineral fertilizers. The N and P contents of the leaves at flowering were similar on both plots, but the K content was higher in the manure-treated plants.

[1279] 633.491-1.81:577.16
BAKER, L. C.; PARKINSON, T. L.; KNIGHT, P. M. The vitamin-C content of potatoes grown on reclaimed land. II. Potatoes grown in 1946. *J. Soc. Chem. Indust.* 67, 1948 (118-120).

The application of varying manurial treatments did not significantly affect the vitamin-C content of potatoes grown on reclaimed fenland.

[1280] 633.491-1.81:581.192
POLLARD, A.; KIESER, M. E.; CRANG, A. Factors affecting keeping quality in potatoes. III. *Long Ashton Res. Sta. Rept.* 1946 (158-167).

The quality of potatoes from various sites and different manurial treatments was studied with special reference to blackening. The intensity of blackening appeared to vary with site, being highest on broken-up acid heath land. Correction of K deficiencies resulted in striking improvements, but where the main deficiency was of Ca, coupled with acidity, it was necessary to correct the latter before the quality and yield could be improved. KCl as a source of K lowered the dry weight and adversely affected the texture of the tubers; P improved texture and starch content. Plots showing N-deficiency symptoms gave very wet and broken tubers, while the use of N where K was low increased blackening.

[1281] 633.491-1.81:581.192
MCLEAN, J. G.; SPARKS, W. C.; BINKLEY, A. M. Fertilizer studies with the Red McClure and Bliss Triumph varieties of

potatoes in the San Luis valley. *Colo. Agric. Expt. Sta. Tech. Bull.* 35, 1947, pp. 20.

Trials were conducted over 4 years in soil ranging from clay to gravel, with a salt concentration of 2000 p.p.m. 200-500 lb./acre of complete fertilizer and S used in combination with a fertilizer containing high P increased yields of both varieties; applications of S alone to the soil increased yield of Red McClure but not of Triumph. Potatoes which received a high N ratio were rough with many growth cracks; those that received a high P ratio were smooth with no growth cracks.

[1282] 633.491-1.811.8:581.192
AZIZBEKOVA, Z. [The effect of chlorides on tuber formation in potato.] *Izv. Azerbaidzhan. Fil. Akad. Nauk* 4, 1944 (50-55). *Hort. Abs.* 18 (41).

Increase of chloride concentration in soil, induced by the addition of von Hoff's solution, resulted in deterioration in growth and tuber formation.

[1283] 633.491-1.83
PEVZNER, R. I. Forms of potassium fertilizers when used for a long time on heavy soils. *Trudy Nauch. Inst. Udob.* 148, 1941 (111-118). *C.A.* 42 (3514).

In experiments with potatoes on heavy soils over a 4-year period K_2SO_4 was the best source of K. Sylvinite and carnallite were inferior to KCl for potatoes, but were the best forms for fodder beet. None of the salts increased the acidity of the soil or affected the composition of exchangeable bases.

[1284] 633.491-1.84:581.12
TANDON, S. L. Effect of nitrogenous fertilizers on the respiration rate of potato tubers. *Curr. Sci.* 17, 1948 (124). [Dept. Botany, Univ. Delhi]

Tubers from plots manured with $(\text{NH}_4)_2\text{SO}_4$ showed a higher rate of respiration at all stages of tuber development than did tubers from unmanured plots. Tubers with high respiration rates have poor keeping quality.

[1285] 633.491-2-1.5
DYKSTRA, T. P. Production of disease-free seed potatoes. *U.S.D.A. Circ.* 764, 1948, pp. 64.

Because so many weeds are hosts of *Bacterium solanacearum* it is impracticable to attempt to eliminate brown rot from potato land by rotation or weed eradication. In sandy soil the disease can be controlled by applying 800 lb./acre of S in summer, followed by 3,000 lb./acre of limestone in autumn. This treatment should not be used on muck, peat, loam or clay. Long rotations are necessary to rid soil of *Spongospora subterranea* which causes powdery scab. *Synchytrium endobioticum*, which causes wart, can remain active in the soil for over 20 years. Cultivation and rotations are recommended together with application to the soil of 2,000 lb./acre of ammonium thiocyanate or 2,500 lb. of flaked CuSO_4 .

Early planting is recommended in land liable to infection with *Heterodera marioni*, as the root knot nematode is less active during cool weather. A 3-year rotation with grains controls the nematode and flooding the land for several months reduces infestation. Soil fumigants, such as D-D, control the disease. *H. rostochiensis*, the golden nematode, is controlled with D-D; control by rotation is difficult because the cysts persist in the soil and release viable larvae for at least 8 years. Infestations with *Ditylenchus destructor*, the potato-rot nematode, and *Pratylenchus* species, the meadow nematodes, are controlled by 3-year rotations.

[1286] 633.491-2.2
McCUBBIN, W. A. Present status of the golden nematode of potato. *Amer. Potato J.* 25, 1948 (131-133).

Soil treatment with DD etc. only reduces the damage temporarily. The most effective action is to suspend potato and tomato culture in all the known infested and exposed land.

[1287] 633.491-2.2-1.432.2
PARRIS, G. K. Influence of soil moisture on the growth of the potato plant and its infection by the root-knot nematode. *Phytopath.* 38, 1948 (480-488). [Hawaii Agric. Expt. Sta., Honolulu]

Potatoes were grown in nematode-infested soil which was kept wet, medium and dry. Moisture content in the wet soil varied from 31 to 36%, in the medium soil from 27 to 32% and in the dry soil from 24 to 27%. Growth was most vigorous and tuber yields were

highest in continually wet soil, but nematode injury was also high. 50% less yield but less galling of tubers and roots was obtained when soil moisture was lowered progressively as the plants grew older. Galling of tubers was less in medium and dry soils, but nematode damage to roots was greatest in dry soils. In potatoes grown in nematode-infested and in chloropicrin-fumigated soils, yields were highest in continually wet fumigated soil and lowest in infested dry soil. Results indicate that for good yields, potatoes need abundant soil moisture, although galling is more severe and noticeable in wet soil than in drier soil.

Evidence was found that *Heterodera marioni* can enter potato tubers through enlarged lenticels which occur commonly on tubers grown in wet soil.

[1288] 633.491-2.3
BARIBEAU, B. Bacterial ring rot of potatoes. *Amer. Potato J.* 25, 1948 (71-82).

A summary of present knowledge of the disease, with 175 references. The pathogen overwinters in the tubers, and there is no proof that it can overwinter in the soil or in the remains of diseased tubers.

[1289] 633.491-2.954: 577.17
BRADLEY, R. H.; ELLIS, N. K. The effect of different rates of application of 2,4-D on the yield of potatoes. *Amer. Potato J.* 25, 1948 (87-89). [Purdue Univ., Lafayette, Ind.]

0.655-0.875 lb./acre of the 70% Na salt incorporated with the regular spray (Basi-cop +DDT) satisfactorily controlled all broad-leaf weeds without decreasing the yield of tubers.

[1290] 633.491-2.954: 577.17
THOMPSON, W. R.; SHUEL, R. W. Weed control in potatoes with 2,4-D. *Amer. Potato J.* 25, 1948 (163-171). [Ontario Agric. Coll.]

2,4-D spray at 1.2 lb./acre of the free acid gave excellent control of the annual broad-leaved weeds in potatoes without apparent detriment to the yield or quality of tubers. New growth and floral parts of the potatoes showed varietal and seasonal differences in reaction to 2,4-D and general recommendations for the use of 2,4-D await further work on varietal response.

633.492 SWEET POTATOES

[1291] 633.492-1.81
HESTER, J. B. Fertilizer practice for the Ranger sweet potato. *Better Crops* 31, 1947 (10-12, 43).

For average sweet-potato soils 1500 lb. of 3-9-12 fertilizer per acre are satisfactory. For good results 500 lb. should be used before or at planting time and the remainder as two side-dressings. 5 lb. of borax per ton and 2-4% of available MgO should be included in the fertilizer. If heavy rainfall occurs after the side-dressing, about 20-30 lb. of extra N should be used as a late side-dressing.

633.5 FIBRE PLANTS

[1292] 633.51-1.67-1.81
AFZAL, M.; SIKKA, S. M.; KHAN, A. J. Variation in ginning out-turn brought about by changes in agronomic treatment. *Proc. Conf. Cott. Grow. Prob. India* 1946, 1947 (274-279). [Cott. Res. Lab., Lyallpur]

Lint weight per acre was generally improved with increased quantities of irrigation water, the application of organic fertilizers and NaNO_3 , late sowings and wider spacings. Different intensities and frequencies of irrigation, the application of water at different dates and flat versus ridge irrigation had little effect on lint production.

[1293] 633.51-1.81:581.192
GULATI, A. N.; AHMAD, N. Effect of fertilizers on fineness of cotton. *Proc. Conf. Cott. Grow. Prob. India*, 1946, 1947 (245-251). [Tech. Lab., Matunga]

20 lb. of N manure lowered mean fibre length. 40-60 lb. doses gradually increased fibre length, but results suggest that Gaorani 12 F-2 cotton needs more N still to improve the staple, especially without irrigation. Increasing doses of super. made fibre weight per cm. coarser in Gaorani 12 F-2. Small doses of N made fibre coarser in Gaorani 6, but 60 lb. of N made the fibre significantly finer. In Gaorani 12 F-2, fibre strength decreased with increasing N. In Gaorani 6, 15 lb. of super. increased fibre strength, but 30 lb. lowered it significantly.

[1294] 633.51-2.4-1.512
JORDAN, H. V.; ADAMS, J. E.; HOOTON, D. R., ET AL. Cultural practices as related to incidence of cotton root rot in Texas. *U.S.D.A. Tech. Bull.* 948, 1948, pp. 42.

In 14 experiments over a period of 6 years the deep-tillage procedure of subsoiling twice and chiseling reduced the losses from cotton root rot regardless of whether the tillage was carried out in years when the crop was sorghum, cotton or cowpeas, provided it was done when the soil was dry. Chisel tillage alone was less effective but the lower expense would justify its use. Repetition of deep tillage for 11 years, however, did not eradicate the disease. Reduction in losses was more marked when deep tillage was practised in conjunction with a cotton-grain rotation than with continuous cotton. In other experiments, the amount of disease was reduced by early-autumn ploughing, especially when combined with the application of N and organic manures and with the practice of crop rotation.

[1295] 633.52-1.5
GRANHALL, I.; LARSSON, N. G. Odling- och beredningsförsök med spånadsväxter under år 1946. [Cultivation and processing trials with fibre plants in 1946.] *Lantbr.-Högsk. JordbrFörsöksanst. Medd.* 22, 1948, pp. 48. [Sw.e.]

A considerable number of field trials testing flax varieties, time of sowing, seed quantities and weed control were laid out in 1946. Of the varieties tested, Hercules was superior to other Swedish varieties and to the Irish varieties Liral Prince and Liral Sussex. While the quality of flax remained unaffected by fertilizer, a significant effect of K on the yield of straw and a tendency to a depressing effect of P on seed formation were found. N increased the yield of straw at some centres, but also decreased the content of long fibre in the straw. Trials in which all combinations of three sowing times and three harvest times were tested showed that early sowing together with early harvesting was the best, especially as regards yield and quality of fibre. Trials demonstrated the importance of weed control in view of the varying results from comparisons of different treatments. Despite higher labour costs hand-pulling proved economically superior

to machine-pulling in eight trials over two years. Some trials with hemp showed that only small differences in quality of the hemp were obtained by fertilizer treatments, whilst the yields were increased by N, P and K. The most advantageous time for harvesting this crop is about a fortnight after the male-flowering time.—S.H.

[1296]

633.52-2.4

MUSKETT, A. E. **The diseases of linseed and flax.** *J. Inst. Corn Agric. Merchants* 3, 1948 (96-99). [Queen's Univ., Belfast]

Fungal diseases of linseed and flax may be divided into those caused by seed-borne parasites and those caused by soil-borne parasites. Of the latter group the most important is flax wilt (*Fusarium Lini* Bolley). The disease is aggravated by high soil temperatures, and epidemics are most common in warm gravelly soils. In general, soil-borne diseases are best avoided by good husbandry and by not growing flax more frequently than every four years, and if possible every seven years, on the same land. If flax is grown on contaminated soil, only resistant varieties should be grown, as no effective soil treatment is known which can be applied on a field scale. The production of resistant varieties is complicated by the occurrence of different strains of the fungus that may react differently to different varieties of flax.

[1297]

633.52-2.4-1.433.2

WAGER, V. A. **Wilt disease of New Zealand Flax.** *Farm. S. Africa* 22, 1947 (871-878).

A waterlogged soil was the main contributing factor to the development of wilt disease caused by *Fusarium oxysporum* f. *Phormii*. The pathogen flourishes in wet soil and its growth stops almost entirely in dry weather.

[1298]

633.524.33-1.5

SAMUEL, P. La culture et le rouissage de l'*Urena lobata* par les indigènes des régions équatoriales du Congo belge. [Cultivation and retting of *Urena lobata* by natives of the equatorial regions of Belgian Congo.] *Bull. Agric. Congo Belge* 39, 1948 (1-28). [F.]

Urena lobata is an entirely native-grown crop the cultivation of which is comparatively simple. In equatorial regions it is grown as

an annual. On newly cultivated forest land it should be preceded by either paddy or maize; if it is grown immediately after deforestation the crop will almost certainly be a failure.

633.6 SUGAR CROPS

(See also Abs. No. 1204)

[1299]

633.61-1.427.3

BORDEN, R. J. **A suggested critical potash level in leaf-punch samples.** *Hawaii. Plant. Rec.* 51, 1947 (139-142).

The percentage of K_2O in leaf-punch samples of 32-8560 cane provides a figure which represents a critical K level. There was no response to K fertilization on 3 soils during 6 months even though the K concentration in leaf-punch samples was below 0.45%. No favourable response to K was found after 10 months on Makiki soil containing 1.12% total K_2O and 0.126% replaceable K_2O , although the K_2O in the leaves had dropped to 0.56%. A favourable response was found on Manoa soil containing 0.84% total K_2O and 0.022% replaceable K_2O after 4 months when the leaf- K_2O concentration was down to 0.33%. Hilo soil containing 0.92% total and 0.028% replaceable K_2O responded to K when the K_2O in the leaves was 0.38%. There was no response to K on Kauai soil containing 1.68% total and 0.009% replaceable K_2O when there was 0.87% K_2O in the leaf samples, but K fertilization had a favourable effect a month later when the K_2O in the leaves had dropped to 0.35%. A value of only 0.28% of K_2O in leaves at 2½ months did not indicate real K deficiency, but 0.26% in the leaves at 4 months was associated with a definite response to K fertilizer.

It is possible that an actual K shortage can exist for some time before symptoms are visible and that K deficiency is acute when leaf symptoms appear. It seems that if leaf-punch samples at 3 months show 0.4-0.5% of K_2O , K fertilizer should be applied immediately.

[1300]

633.61-1.847.2-1.461.51

USHIKOSHI, I. **Studies on the planting of the cane sugar. I. Inoculation with azotobacter.** *J. Soc. Trop. Agric. Taiwan* 16, 1944 (122-128). C.A. 42 (2706).

By inoculating soil with *Azotobacter vinelandii* and *A. chroococcum* the N fixation in soil and the growth of soil bacteria increased. Yield of cane increased 4-7% and of refined sugar 10%.

[1301] 633.61-2.7-1.5
VENKATACHARYA, B. V. **The light earthing-up technique for control of the sugar-cane dead-heart borer.** *J. Mysore Agric. Expt. Un.* 19, 1941 (128-134).

Light earthing-up on stems to a height of 1½ inches immediately after germination prevents egg-laying by moths.

[1302] 633.61-2.954:577-17
SHAW, H. R.; CONRAD, P. F.; AMUNDSEN, R. F. **Weed control by 2,4-D with notes on application by air-plane.** *Hawaii. Plant. Rec.* 51, 1947 (155-175).

Applications of more than 5 lb./acre of 2,4-D depressed cane germination when applied immediately after planting and before cane-seed germination took place. Rates of application for plant cane and ratoon cane are recommended and equipment for application from the air is described.

[1303] 633.63-1.531
SARU, N.; CÂMPINEANU, D.; IONESCU, D. **Contribuțiuni la studiul metodelor culturale la sfecla de zahăr. [Contributions to the study of methods for cultivating sugar beet.]** *An. Inst. Cerc. Agron. Român.* 18, 1946, 1947 (61-95). [Rm.f.]

The effects of different sowing times on sugar beet were studied in a red-brown forest soil, a chestnut chernozem and a degraded chernozem. Late sowing increased the number of gaps and decreased the yield of roots and sugar. The losses of roots and sugar due to late sowing were, for each day's delay, 97-225 kg. and 14-41 kg. respectively for an early variety and 452-538 kg. and 72-84 kg. for a late variety. Leaf production and high sugar content were favoured by spacing distances of 40 × 20, 50 × 20 and 30 × 20 cm.

[1304] 633.63-1.582-1.81
LILL, J. G. **Influence of crop-sequence and fertilizers upon the sugar beet crop.** *Proc. Amer. Soc. Sug. Beet Tech.* 1946 (54-63).

Sugar beet does not generally have a deleterious effect on soil as reflected in yields of following crops except where beet follows beet. When soybeans followed sugar beet, yields were slightly depressed, but when maize and oats followed sugar beet both 7-year and 3-year average yields were better than when either of these crops followed maize, oats or soybeans for hay or for seed. The number of marketable sugar-beet roots and weight of individual roots was greater after soybeans and maize than after oats, but a sugar-beet crop following oats was better than one following sugar beet. Higher numbers of marketable roots, better yield per acre and better quality roots were obtained when 300 lb./acre of 4:10:6 fertilizer were applied to sugar beet and all were higher when the fertilizer was applied to the sugar beet in the current year than when applied to the preceding crop.

[1305] 633.63-1.81:581.192
HELLINGA, J. J. A. **Laboratoriumproeven ter bestudering van de invloed van de bemesting op groei en minerale samenstelling van de suikerbiet. III. Bemestingsproef met dusariet in 1942. [Pot experiments in the study of the effect of manuring on the growth and mineral composition of sugar beet. III. Manuring experiments with dusarite in 1942.]** *Meded. Inst. Ration. Suikerprod.* 1946, No. 5, 1948 (149-181). [Du.e.f.]

Progress is reported of experiments on the influence of Na, K, Ca and NH₄ on the absorption of nitrate N by sugar beet. Dusarite, an activated carbon with cation-exchange properties, was used in the cultures.

[1306] 633.63-1.821.2
RAGALLER, F. **Zur Frage der Gipsbehandlung von Zuckerrübensaatgut. [The treatment of sugar-beet seed with gypsum.]** *Ztschr. Pflanz. Düng.* 39, 1947 (35-49). [G.] [Anhalt Expt. Sta., Bernburg]

The soil used was a humous loessial loam. 1-3 kg. of powdered raw gypsum when thoroughly mixed with 30 kg. of seed caused increases in yield of roots, dry matter and sugar content of 0-17% and of tops of 0-11%, but was always inferior to commercial burnt gypsum, which caused increases of about 5-22%. One brand of burnt gypsum failed

to cause any increases, for reasons not known. Gypsum treatment causes earlier germination and a more vigorous emergence, resulting in an increase in (1) the number of plants per unit area and (2) the average root weight. The efficiency depends on fine grinding and thorough mixing, on the use of good-quality seed, and is affected by the weather during the growing period, particularly at the time of emergence.

[1307] 633.63-2.2-2.953
THORNE, G.; JENSEN, V. **A preliminary report on the control of sugar-beet nematode with two chemicals, D-D and Dowfume W15.** *Proc. Amer. Soc. Sug. Beet Tech.* 1946, 1947 (322-326). *Biol. Abs.* 22 (197). [Amalgamated Sug. Co., Ogden, Utah]

D-D at 250 lb. or more per acre controlled sugar-beet nematode for one year. 500 lb./acre injured seedlings slightly and 1000 and 2000 lb. caused severe injury. Seedlings should not be planted less than a week after a 250-lb. application. 200 lb. and 400 lb./acre of a 15% solution of Dowfume W15 gave similar control and a delay of only 3-4 days between application and planting is necessary. Growth was stimulated by both chemicals. Tops were unusually large with the 400 lb. application of Dowfume W15, but the roots were smaller and lower in sugar content.

633.7 STIMULANTS

[1308] 633.71-1.4
SILBERSCHMIDT, K. **[Development of the cultivation of tobacco and of potatoes in relation to the external conditions of new arable soils.]** *Acta Trop.* 3, 1946 (264-280). *Chim. Indust.* 58, 1947 (74). *C.A.* 42 (3513).

[1309] 633.71-1.421
CUZIN, J.; SCHWARTZ, D. **Étude statistique de la croissance du tabac sur le champ. [Statistical study of the growth of tobacco in the field.]** *Ann. Agron.* 18, 1948 (39-59). [F.]

The growth of tobacco was studied statistically, taking the field rather than the plant itself as a unit. The mean number of leaves was proposed as a main, and the withered, missing and flowered plants as

secondary, parameters. Increases in the mean number of leaves resulted from application of fertilizers, which acted rapidly after transplanting as shown by examination of the withered plants. Cultural homogeneity of the soil could also be investigated by study of the mean number of leaves.

[1310] 633.71-1.828 : 546.56
THE LIGHTER. **Now leaf soil demands some copper, too.** *Lighter* 18, No. 2, 1948 (17).

A note on F. A. Gilbert's work at the Battelle Memorial Institute. CuSO_4 at 10-50 lb./acre was applied with the regular fertilizers to tobacco over 4 years. Yields were increased in 63 of 89 tests covering several States, the maximum increase being 35%. Quality was improved in 9 tests. Reduced growth is usually the only symptom of Cu deficiency.

[1311] 633.71-1.875
MOFFETT, A. A. **The use of compost for flue cured tobacco.** *Rhod. Agric. J.* 44, 1947 (654-673).

Compost modified considerably the chemical composition of the cured leaf and made substantial contributions to the major fertilizer requirements. The degree of breakdown of the compost was of secondary importance, provided the C:N ratio was at a suitable level. Methods of manufacture vary widely. The results emphasize the importance of balancing the P and N supply, which in a dry season means avoiding excess N.

[1312] 633.73-1.851
PEREIRA, H. C. **Phosphate fertilizers for Kenya coffee.** *Coffee Bd. Kenya Mo. Bull.* 12, 1947 (45). *Hort. Abs.* 17 (304).

A note on the suitability of Uganda phosphate for coffee.

[1313] 633.73-2
WELLMAN, F. **Progress report on coffee root rots in the coffee of El Salvador.** *Café Salvador* 16 (178), 1946 (105-117). *Biol. Abs.* 22 (193).

Symptoms of root rot are sudden death of the tree during the rainy season and slow collapse during the dry season. The use of fertilizer holes, which is a common practice, favours the development of the disease as the roots are damaged and exposed.

[1314] 633.73-2.2
FLUITER, H. J. DE [Eelworm problems in coffee.] *Tijdschr. PlZiekt.* 53, 1947 (101-109). Hort. Abs. 18 (64). [Du.]

In Javan coffee, *Heterodera marioni* is noxious only to nursery plants on which it causes root galls. The disease is controlled with warm water treatment and starvation methods to exterminate the eelworms in infested soil.

[1315] 633.73-2.4-1.415.1
ALVAREZ GARCIA, L. A. Studies on coffee root disease in Puerto Rico. I. A coffee *Fusarium* wilt. *J. Agric. Univ. P.R.* 29, No. 1, 1945 (1-29). [E.sp.]

Under greenhouse conditions, coffee *Fusarium* wilt occurred mainly with low pH values of the substratum. The incidence above pH 6 was small and infection did not occur when the pH of the substratum was above 6.5.

633.8 AROMATIC, MEDICINAL AND OIL PLANTS

(See also Abs. No. 1366)

[1316] 633.821-1.584 : 634.573
HERNANDEZ-MEDINA, E. The cashew—a promising support for vanilla. *J. Agric. Univ. P.R.* 29, No. 1, 1945 (30-34). [E.sp.]

Two-year-old cashew bushes (*Anacardium occidentale*) provided much better support and shade than 4-year-old bauhinia (*Bauhinia reticulata*) and bucare (*Erythrina berteroana*) for vanilla cuttings planted on an open hillside without additional shade or wind protection.

[1317] 633.854.54-1.5
STOA, T. E. Growing flax in North Dakota. *N. Dak. Agric. Expt. Sta. Bimo. Bull.* 10, 1948 (80-87).

Competition from weeds is the most serious obstacle to successful flax production for linseed. Cultural practices for control of weeds should usually begin a year or more before the flax is to be sown. The most successful method is to manage the fields so that weed competition is always at a minimum, and to sow flax following a crop where weed competition is small, e.g., after maize or some other intertilled crop, or even grass if this was down long enough to permit rotting of buried weed seeds. A firm seed

bed and early sowing are generally recommended. Spring ploughing on lighter soil insures relatively clean flax. The soil should be ploughed, well packed and the seed sown the same day. Where rust is prevalent, rust-resistant varieties should be sown.

[1318] 633.88-1.81
MOLDENHAWER, K. Doświadczenia nawozowe z roślinami leczniczymi. [Manuring experiments with medicinal plants.] *Przeg. Doświad. Roln.* 3, 1947 (223-241). [Pl.e.]

Results of manuring experiments from Polish, English, French, Russian and German works up to 1939.

633.91 RUBBER PLANTS

[1319] 633.913.31-1.432.2
KELLEY, O. J.; HUNTER, A. S.; HOBBS, C. H. The effect of moisture stress on nursery-grown guayule with respect to the amount and type of growth and growth response on transplanting. *J. Amer. Soc. Agron.* 37, 1945 (194-214). [U.S.D.A., Salinas, Calif.]

Guayule plants grown in the nursery under high moisture stress produced significantly less vegetative growth than plants grown under low moisture stress. When transplanted, the former resumed growth more quickly, grew more vigorously and had a much higher percentage survival; they were better able to withstand unfavourable conditions after transplanting and had higher rubber and lignin contents; they could be transplanted at any time of the year, provided soil moisture and temperature conditions were favourable. Plants grown under low-moisture stress required 4-6 months' hardening to give about as high a percentage survival after transplanting. Under the conditions of the experiment there was little difference in the depth of root penetration by plants grown under high and low moisture stresses. The seedlings obtained their water from the soil to a depth of 42-48 inches. While the soil moisture was at low tension near the surface, water was absorbed almost entirely in this region; when the top soil approached wilting point, water was absorbed from the lower depths.

[1320] 633.913.32-1.5
BERNADOWSKI, J. Możliwości uprawy kok-saghyzu, czyli mniszka kauczukodajnego (*Taraxacum kok-saghyz*) w Polsce. [The possibilities of cultivating kok-saghyz (*Taraxacum kok-saghyz*) in Poland.] *Przeg. Doświad. Roln.* 3, 1947 (194-200). [Pl.e.] [Inst. Agric. Res. Putawy]

Kok-saghyz was discovered in 1931 in Kirghizia and tested in Poland in 1934-38. Since *Taraxacum officinale* grows wild in Poland, the prospects for the success of *T. kok-saghyz* appeared good, provided the right cultural conditions could be found. On the basis of further experimental work on stratification, sowing and harvesting the following suggestions are made.

The moistened seed should be sown in July on a deep soil of good structure and well supplied with lime. The plant is sensitive to competition and weeding must be thorough. Presence of wild dandelion is especially undesirable in seed crops. One-year plants should be harvested as late as possible in autumn, and no harm is done if the plants are left until the soil thaws in spring. Harvesting of two-year plants needs more attention, since the outer layers of the roots may come away leading to loss of rubber. A beet-lifter or spade is the best implement. 44 quintals of roots have been obtained from half a hectare on one estate.

The content of rubber on two soils was highest (about 11%) with a July harvest.—R.N.

[1321] 633.913.32-1.85:581.192
FERNANDEZ, R. N.; FERNANDEZ, A. N. Role of phosphates in the first phases of growth and development of *Taraxacum kok-saghyz*. *Ion* 7, 1947 (171-172). C.A. 42 (3031).

The addition of super. corresponding to 0.05 and 0.15 gm. of P_2O_5 per kg. of soil caused plants to grow 4 times as fast as the controls and their contents of carbohydrates, proteins, phosphatides and nucleoproteins increased. Large amounts of inorganic phosphates were accumulated.

634 ORCHARDS. FRUIT

(See also Abs. Nos. 1219, 1385)

[1322] 634-1.61
AGRICULTURE. Orchard renovation. *Agriculture* 54, 1947 (426-430).

A neglected soil should be disced or ploughed in late autumn or winter when the soil is moist, followed by discing or harrowing in spring. Before the first spring cultivation, up to 5 cwt./acre of $(NH_4)_2SO_4$ should be broadcast and further dressings of 2-5 cwt./acre should be applied during summer. Cultivation should be continued in the second year. K deficiency may occur on lighter soils or where haycrops have been taken. Annual dressings of 2 cwt./acre of K_2SO_4 or 10 tons/acre of stable manure are sufficient, except where leaf scorch is severe. If orchards are to be grazed, 10 cwt./acre of high grade basic slag or 3-5 cwt. of super. should be applied in winter at intervals of 3-4 years. On acid soils where wild white clover is scarce and where Yorkshire Fog predominates, land should be limed.

[1323] 634-2.III-1.4
WIERSZYŹŁOWSKI, J.; KOTAR, S. Wyniki badań gleboznawczych w sadach powiatu Błonie i Sochaczew. [Soil investigations in orchards.] *Przeg. Doświad. Roln.* 3, 1947 (174-189). [Pl.e.] [Inst. Pomol. Univ. Poznań]

In a small market-gardening region near Warsaw about 4% of the cultivated area is under orchard. Some 80% of the fruit trees were killed by frost in the winter of 1939-40, and a reconnaissance soil survey was made to ascertain which soils were most likely to be suitable for fruit trees. Special attention was paid to presence of sand or clay, depth of humus layer, permeability and subsoil water. The soil types range from marshy chernozem to upland podzols. Thirteen types are distinguished, of which medium-textured and silty podzols on clay and chernozem on clay are recommended for apples, pears and plums. Trees on these soils had a relatively low mortality from frost. Gleyed podzols, gleyed or indurated black earths (mostly on sand) and sands were less generally suitable; a very high percentage of trees on such soils were frost-killed.

Lime is important. The best soils were podzols on brown clay which occurred mainly in the higher levels of the Szymanów-Sochaczew districts where aeration and water regime are good and the soils alkaline; in contrast the black soils of the low-lying Błonie region were gleyed and acid. Drainage

and supply of organic matter can accomplish a good deal for small orchards, but for commercial success the prime condition is selection of sites with inherently favourable soil characteristics.—R.N.

[1324] 634-2.191-1.811.9
MULDER, D. De gevolgen van onevenwichtige voeding van vruchtbomen. [The effects of unbalanced nutrition of fruit-trees.] *Meded. Direct. Tuinb.* 11, 1948 (187-195). [Du.e.] [Zeelands Proeft. Wilhelminadorp]

The symptoms of lime-induced chlorosis and deficiencies of Mg, Zn and B in apple trees are described. Fe deficiency may also occur when the root structure is poor due to the presence in the soil of an impermeable layer which causes water-logging in winter and prevents the roots from penetrating to the deep, moist levels in summer. As excess of Ca cannot be corrected quickly, Mn chlorosis can only be controlled by spraying or injecting solutions of MnSO_4 . The injection method is preferable for Fe chlorosis. In many cases deficiency of Mg is K-induced and that of Zn, P-induced. Occurrence of symptoms in both cases can be prevented by spraying with solutions of the appropriate sulphate.

[1325] 634.1-2.19 : 546.47
MULDER, M. D. Carences zinciques chez des arbres fruitiers en Europe. [Zinc deficiencies in fruit trees in Europe.] *C.R. Acad. Agric.* 34, 1948 (177-178). [F.] [Agric. Expt. Sta., Groningen]

A disease of apple, pear and cherry trees is described that has been noticed in Hungary, Switzerland, Holland and Denmark since 1940. The symptoms include a decrease in the size of fruit and leaves, narrowing of the leaves, with chlorosis between the leaf veins and a tendency towards proliferation of twigs at the ends of branches. The symptoms, which have been dispelled by spraying the leaves with 5% ZnSO_4 , are thought to be due to Zn deficiency, possibly associated with abundance of P in the soil.

[1326] 634.11-1.584
ANTHONY, R. D.; FARRIS, N. F.; CLARKE, W. S., JR. Effects of certain cultural treatments on orchard soil and water losses and on apple tree growth. *Penn. Agric. Expt. Sta. Bull.* 493, 1948, pp.16.

Exposing the soil long enough to seed two cover crops a year caused excessive runoff and soil erosion when summer storms were heavy. Trash of spring cover and growth of autumn cover were insufficient to protect the surface, especially during periods of thawing in winter. Seeding one cover crop early each year decreased runoff and soil loss. The use of bluegrass and lucerne sods increased soil organic content and surface permeability. Heavy annual applications of N to bluegrass were necessary for apple trees on a limestone soil and super. and K increased grass growth. Applications of N to lucerne were unnecessary.

[1327] 634-2-2.191 : 546.711 : 546.72
KOOT, Y. VAN. Bestrijding van chlorosis bij perziken-en pruimebomen onder glas door middel van boorgat-behandeling. [Control of chlorosis in peach and plum trees under glass by means of injection technique.] *Tuinbouw* 3, 1948 (7-10). [Du.]

Fe and Mn deficiencies in peaches and plums occur on the clay and sandy soils of S. Holland where the pH is more than 6.5. The sandy soils of Westland are not naturally alkaline but chlorosis occurs there as a result of frequent liming. Poor soil structure and insufficient irrigation are also factors in the incidence of chlorosis, especially in peaches. Symptoms are detailed. The simplest method of control is to apply 3-4 lb./acre of MnSO_4 or FeSO_4 to the soil in spring; applications may have to be repeated in light sandy soils where the fertilizer quickly leaches out beyond the zone of the tree roots. Fe or Mn citrate may also be injected into the trunks; details of the method are given.

[1328] 634.25-1.5
STARK, A. L.; THORNE, D. W. Peach orchard soil management studies. *Utah Agric. Expt. Sta. Bull.* 330, 1948, pp. 27.

The fertilizer treatments (a) 3 lb. of $(\text{NH}_4)_2\text{SO}_4$ to each tree, (b) 3 lb. of treble super., (c) a combination of (a) and (b), (d) cow manure at 10 tons/acre and (e) no fertilizer, were repeated with each of the cover crops (1) alfalfa (2) hairy or winter vetch and (3) weeds, from June the 1st until the end of the peach harvest, with previous clean cultivation.

The cover-crops did not significantly affect fruit quality, tree growth or yield over the

5-year period of study, but it is considered that the long-term advantage from (2) or other legumes or small grains would be considerable. (1) greatly increased the water requirement of the plots. Peach yields were greatest with (c) followed by (a) and (d), but quality was unaffected by any treatment. (a) and (d) delayed the harvest peak by 3-5 days. Average tree growth was greatest with (c), followed by (b). Manure and P should be disced in to a depth of four inches only.

[1329] 634.3-1.584-1.81
FERTILISER AND FEEDING STUFFS JOURNAL.
Fertilisers in South Africa. *Fert. Feed. J.*
34, 1948 (249-250).

Points from the annual report of the Division of Horticulture describing research at the Nelspruit Research Station are presented.

In the long-term research on citrus fertilizing N as well as P has become a limiting factor for yield, while the effects of fertilizers on fruit quality are the same as in previous years. In an additional experiment cover crops had a beneficial effect, but yields were only 80% of those from crops receiving inorganic N or manure. Where nitrification of NH_4 is slow, rapid absorption of NH_4 by the tree may occur to the detriment of the crop; also, in soils with a low supply of bases, NH_4 nitrogen leaches out easily. On such soils lime should be added before application of $(\text{NH}_4)_2\text{SO}_4$, or NO_3 fertilizer should be used.

[1330] 634.3-1.81:551.577
CHAPMAN, H. D. **Citrus fertilization: some contrasts between California and Florida.** *Calif. Citrog.* 32, 1947 (383-384). *Biol. Abs.* 21 (2527).

In Florida with an annual rainfall of 50 inches, P, K, Mg and B fertilizers are used, but they seem to be unnecessary in California where the annual rainfall is less than 20 inches.

[1331] 634.3-2.2
FOOTE, F. J.; GOWANS, K. D. **Citrus nematode.** *Calif. Citrog.* 32, 1947 (522-523, 540-541). *Hort. Abs.* 18 (60).

Citrus nematode, *Tylenchulus semipene-trans*, can be eradicated by fumigation and replanting. Planting of an infested tree can cause the soil to become heavily infested in 10 years' time.

[1332] 634.58-1.5
MARSHALL, R. M. **Peanut land and what it needs.** *Better Crops* 32, No. 3, 1948 (6-9, 48-49).

Cover crops properly fertilized, strip crops of grain sorghum or crotalaria and rotations with vetch or rye minimize soil losses from wind erosion on deep, coarse, sandy soils in Texas. 200-300 lb./acre of 0-14-7 fertilizer + 6-8 lb. of N have increased yields 30-100%.

[1333] 634.58-2.4-1.417
MORWOOD, R. B. **Control of field crop diseases. Peanuts.** *Queensland Agric. J.* 66, 1948 (20-23).

Germinating peanuts require plenty of humus in the soil, and the amount of humus directly affects the incidence of crown rot. Although rotation with maize is beneficial, a few years under grass is recommended for the control of crown rot. The accumulation of humus in the soil is more important than the elimination of diseased peanut material.

[1334] 634.61-1.81
SALGADO, M. L. M. **Recent studies on the manuring of coconuts.** (contd.) *Trop. Agricst.* 102, 1946 (206-218).

From a statistical point of view a $3 \times 3 \times 3$ or similar factorial design is far more satisfactory for coconuts than randomized blocks or Latin-square designs. In manurial experiments of the above design on good coconut soils P_2O_5 gave no response, the response to N was poor and K_2O gave increases of 25 to 30%. K is therefore the dominant manurial requirement for coconut palms. Coconut palms may be the only tropical crop in Ceylon that has a poor response to N. The response to K_2O showed a rise and fall during alternate years. This may be due to fixation of K_2O during droughts, and it may be advisable to apply K_2O in small annual doses rather than in biennial full doses.

In experiments on an extremely poor lateritic gravel there was a response to P_2O_5 , and in the fourth year P_2O_5 formed a limiting factor to the response to N and K in combination. From the fourth year N affects copra output adversely, K_2O consistently improves it and P_2O_5 appears to have no effect.

[1335] 634.61-1.81
SALGADO, M. L. M. **Recent studies on the manuring of coconuts in Ceylon (continued).** (5) Manuring of fodder grasses grown between palms. (6) Cover crop experiment. *Trop. Agricst.* 103, 1947 (5-11).

Where no manure was applied, Napier grass grown between the palms depressed yield of copra by up to 39% in the fourth year of the experiment. On plots with no Napier grass, heavy applications of N reduced copra yield by 10%, but on the grassed plots yield was increased by 44% over the unmanured grassed plots. NPK increased yield by 38% on the ungrassed plots and by 59% over the unmanured on the grassed plots. Manuring with NPK increased yield of Napier grass 8-fold, but even so yield was poor. Napier grass has a high K requirement and competes with palms for K. The possibility of growing Napier grass for fodder between palms without affecting copra yields seems remote. Coconut pastures might be improved by introducing legumes and by rotational controlled grazing.

On lateritic gravels, growth of *Centrosema* reduced yield of coconuts. Application of manure to this cover crop in the second year caused a recovery in the fourth year. When K, NK and NPK were turned in with the cover crop, yields were the same; absence of K reduced yields significantly.

[1336] 634.7-2.191-1.811.6
PEARSE, H. L. **Marginal scorch and chlorosis of the leaves of berry fruits.** *Farm. S. Africa* 22, 1947 (742-745).

The unhealthy appearance of plants growing on light soil of pH 4.5 was due to Mg deficiency accentuated by an unbalanced K/Mg nutrition. Application of lime and $MgSO_4$ reduced the number of leaves showing symptoms of the disease.

[1337] 634.73-1.874
CHANDLER, F. B. **Cultivation of low-bush blueberries.** *Proc. Amer. Soc. Hort. Sci.* 49, 1947 (205-207). [Mass. Expt. Sta., E. Wareham]

The incorporation of a fertilized buckwheat crop into the soil and the mixing of 1 inch of peat with the top 6 inches of soil increased the number of stems of blueberry plants; the use of peat alone increased the spread of

plants. Frequent burning decreased the number of plants and the spread of plants and should not be done oftener than once in 3 years.

[1338] 634.76-1.671-1.415.1
STEVENS, N. E. **Acidity of soil and water used in cranberry culture.** *Trans. Wis. Acad. Sci.* 38, 1946 (185-188). C.A. 42 (2381). [Univ. Ill., Champaign]

Flooding water used in Wisconsin and Massachusetts mostly had pH of 6.1-7.0, but in Wisconsin some waters were below pH 6.1 and some above 7.0. 90% of the Massachusetts waters were soft and the Wisconsin waters were either hard or medium hard.

[1339] 634.776-1.5
McCANN, L. P. El lulo, una fruta tropical de facil cultivo. [The naranjilla, an easily grown tropical fruit.] *Agric. Trop. Bogotá* 4, No. 3, 1948 (11-14). [Sp.]

The *Solanum quitoense* grows in Andean valleys near to the Equator, at altitudes of 1200-2400 m., under a rainfall of 1500-3700 mm., and has failed to produce fruit crops when grown far from its place of origin, probably because of the greater annual temperature range away from the Equator. The seeds are sown in a nursery bed, and the young plants are transplanted to 2 m. apart in virgin selva soil in the shade of large trees, the bushes first being removed. The larger weeds are removed twice yearly, and the naranjilla begins to fruit after 12 months. After 3 years of fruiting, the yield falls, due possibly to the secretion of an autotoxin into the soil or to an exhaustion of some mineral nutrient.

[1340] 634.8-1.4
ALDERFER, R. B.; FLEMING, H. K. **Soil factors influencing grape production on well-drained lake terrace areas.** *Penn. Agric. Expt. Sta. Bull.* 495, 1948, pp. 24.

Among the different soils, water-holding capacity or drainage was the most important factor. Soil N increased plant growth, but 120 lb./acre of soluble N + 150 lb. of P_2O_5 + 150 lb. of K_2O did not increase the yield of grapes in some areas. Soils having high amounts of total N also contain larger amounts of organic C, available moisture, silt and clay, and the use of large amounts

of fertilizer on soils where these constituents are low does not increase grape production. Texture was not as closely correlated with growth and yield as was organic C and total N, but plots giving the highest yields had relatively high contents of clay and silt in the surface layers. Non-capillary porosity and pH had no effect on grape production. Cover cropping, manuring and the use of plant residues such as straw and hay as soil amendments are recommended, especially on the heavier textured areas.

[1341] 634.8-2.3
MACFARLANE, C. S. The activity of the "vlamsiekte" organism in soils. *Farm. S. Africa* 22, 1947 (820-822). [Fruit Res. Sta., Stellenbosch]

"Vlamsiekte" disease of vines, caused by *Erwinia vitivora*, is spread mainly by cuttings or prunings from contaminated stock. During investigations in 1946, newly planted vines which had been in competition with full grown infected vines had not thrived and showed signs of ill health below soil level. Isolations from 4 of these cuttings were *E. vitivora* which when inoculated into healthy vines gave typical symptoms of "vlamsiekte." Bacteria belonging to the same group were isolated from soil: 11 of these produced the disease in healthy vines while the remainder, though closely related to *E. vitivora*, were not pathogenic to vines. Evidence shows that the presence of *E. vitivora* in the soil is a potential danger to vines. Danger from the use of grape residues as manure is not diminished by air-drying or keeping the material for several months before use.

[1342] 634.8-2.4-1.81
DU PLESSIS, S. J. Die voorkoms en bestryding van roetdou op Sultanastokke veroorsaak deur *Exosporium sultanae* nov. spec. [The occurrence and control of sooty dew on sultana vines caused by *Exosporium sultanae* n. sp.] *Ann. Univ. Stellenbosch* 24A, 1946, pp. 32. R.A.M. 27 (216-217).

Resistance of sultana vines to a leaf blotch disease caused by *Exosporium sultanae* was not appreciably strengthened by the application of N, P, K, manure or lime. Heavy rainfall during the early growing season favours attack.

634.9 FORESTRY

(See also Abs. Nos. 1134, 1135, 1174)

[1343] 634.9-1.459-1.61
KELLER, J. W. Forestry and soil conservation. *J. Forestry* 46, 1948 (340-343).

A popular account of the forestry aspect of farm planning in the timbered areas of the United States and of conservation work in farm woodlands.

[1344] 634.94-2.181
VLAD, I. Rezistentia la inundatii a speciilor forestiere din bazinul inferior al Ialomitei. [Flood resistance of forest species in the lower Ialomita valley.] *Rev. Pădurilor* 56, 1944 (85-93). For. Abs. 9 (363). [Rm.g.]

Observations of exceptional floods indicate that *Salix alba* and *Fraxinus americana* can survive one year's waterlogging, but no species can survive more than two years'. The following species, in decreasing order of resistance, may be planted on land liable to flooding: *Salix alba*, *Populus alba*, *P. nigra*, *Quercus robur*, *Fraxinus excelsior*, *Pinus communis* [?], *Ulmus procera*, *U. foliacea*.

[1345] 634.952
TIRÉN, L. Om skogsodling i Norrland. [Artificial regeneration in Norrland.] *Norrlands SkogsvFörb. Tidskr.* 1946 (269-307). For. Abs. 9 (302-303). [Sw.]

Problems in the artificial regeneration of conifers are surveyed. In preparing the site, burning is the best method of promoting humus decomposition and raising the nutrient status of the soil. Sowing methods must be judged largely by their effectiveness against drought and frost-heaving, factors which make exposure of the mineral soil essential and a covering of relatively non-capillary material desirable. Covering with sawdust and spruce slash was successful in trials, but neither method is applicable on a large scale. When planting, compost of forest humus and lime should be applied, but not N and P, or mycorrhiza formation may be inhibited. Animal manure should be avoided on account of weed growth. Planting is preferred to sowing where the humus is more than 8 cm. deep, on wet land liable to bad frost-heaving and where the ground flora is likely to be troublesome.

[1346] 634.953.6-2.4
WRIGHT, E.; WELLS, H. R. **Tests on the adaptability of trees and shrubs to shelterbelt planting on certain *Phymatotrichum* root rot infested soils of Oklahoma and Texas.** *J. Forestry* 46, 1948 (256-262).

Losses due to root rot appeared to be considerably less on freely permeable sandy soils than on less permeable soils. None of the tree or shrub species used was immune to infection, but a few were highly resistant and only these should be planted on the less permeable soils. The selection of the species to be used depends in part on the degree of protection required. A five-row shelterbelt of resistant species is suggested that should provide satisfactory protection for many years.

[1347] 634.956.4-1.462
ZHURAVLEV, I. I. **[Practical notes on the disinfecting of forest seeds and soil.]** *Tsent. Nauch. Isled. Inst. Les. Khoz.* 1947, pp. 26. For. Abs. 9 (308). [R.]

A practical guide to the control of damping-off, especially that caused by *Fusarium* spp. Treatments include sterilization of the soil with solutions of formalin, mineral acids or KMnO_4 , fumigation with formalin, heating with boiling water or burning brushwood and application of fungicides after sowing.

[1348] 634.956.4-2.4-2.953
FREZZI, M. J. **[Contribution to the study of damping-off or seedling disease in the Argentine Republic.]** *Min. Agric. B. Aires Misc. Pub.* 30 Ser. A III. 1947, pp. 40. R.A.M. 27 (204).

A mixture of soil and compost in boxes was saturated with 20-40 l./sq.m. of 2% formalin 6-8 days before sowing disinfected *Pinus* seed. When half the seedlings had emerged the soil surface was dusted with 216 gm./sq.m. of ZnO . Some of the treated boxes were entirely free from damping-off and in none did it exceed 6%. Losses of nursery plants were reduced by the use of well rotted manure, ample light and moderate irrigation.

[1349] 634.957
CHAMPION, H. G. **Afforestation as a world problem.** *J. Roy. Soc. Arts* 96, 1948 (430-439). [Dept. Forestry, Univ. Oxford]

The destruction of forests due to deterioration of climate, shifting cultivation, clearing for cultivation, grazing and burning is discussed. Objectives of afforestation are the stabilization of moving sand and of denuded hillsides, conservation of soil in hilly country and land liable to ravine formation, protection against injurious wind effects on agricultural land and bringing into productive use wastelands such as heath, moors, poor grassland, desert and bogs, capable of supporting tree growth.

635 HORTICULTURE

(See also Abs. No. 1242)

[1350] 635-1.582
CROSS, P. E. **The place of vegetable crops in farming.** *Agric. Prog.* 22, 1947 (106-112).

A discussion of the inclusion of vegetable crops in a general farm rotation using existing machinery without extensive readaptation. A small irrigation set, capable of being drawn by a farm tractor, is recommended for supplying overhead water during drought periods.

[1351] 635.25-1.584
HANSEN, C. M.; BARRONS, K. C.; FRENCH, G. W. **The chemical control of grain windbreak rows in muck crops.** *Mich. St. Coll. Quart. Bull.* 30, 1948 (309-316).

Growth of windbreak rows of grain, interplanted in onion crops, can be controlled effectively by spraying, using hoods or shields to prevent the spray mist from reaching the onions. The soil need not be disturbed for weeding until the crop is well established and wind protection afforded by the grain reduces the need for permanent windbreaks.

[1352] 635.262-1.81
PEIRIS, H. A.; CHANDRARATNA, M. F. **Cultural studies with garlic. (*Allium sativum* L.) I. Variety, spacing and manurial trials at Palugama and Boraland.** *Trop. Agricst.* 102, 1946 (202-205).

At Palugama, wide spacing was significantly inferior to closer spacing and an application of 35 tons/acre of manure increased yields significantly over lighter applications.

[1353] 635.263-2.4-2.953
TIMS, E. C. **White rot of shallot.** *Phytopath.* 38, 1948 (378-394). [La. Agric. Expt. Sta., Baton Rouge]

Lime applied at the rate of 1500 lb./acre reduced the severity of white rot in shallot, but did not give satisfactory control. Semesan and mercuric chloride applied to the soil around the plants gave fairly good control.

[1354] 635.64-1.5
MINISTRY OF AGRICULTURE AND FISHERIES.
Tomatoes. *Min. Agric. Bull.* 77, 1948, pp. 67.

The cultivation of tomatoes in glasshouses and in the open is discussed from the point of view of soils, propagation, preparation of the soil, mulching and top-dressing. The effect of air and soil temperature on tomatoes and common diseases and pests are described.

[1355] 635.64-2
DOOLITTLE, S. P. **Tomato diseases.** *U.S.D.A. Farm. Bull.* 1934, 1948, pp. 82.

Symptoms and control measures of tomato diseases caused by bacteria, fungi, virus, insects, nematodes and physiological disorders are detailed. Methods of control include crop rotation, disposal of crop refuse, use of chemicals and soil sterilization.

[1356] 635.64-2.8-1.811
SELMAN, I. W. **Resistance to mosaic infection in the tomato in relation to soil conditions.** *J. Pomol.* 23, 1947 (71-79). [Cheshunt Expt. Res. Sta.]

Tomato plants inoculated with tobacco mosaic virus were grown in greenhouse borders treated with dried blood and super. with and without K_2SO_4 and dung, and watered at two different levels. The resulting data suggested that excessive manuring combined with heavy watering should be avoided. There was no simple relationship between resistance to infection and any one constituent of soil or leaf.

[1357] 635.65-2.4-1.432.2
YU, T. F.; FANG, C. T. **Fusarium diseases of broad bean. II. Further studies on broad bean wilt caused by *Fusarium avenaceum* var. *Fabae*.** *Phytopath.* 38, 1948 (331-342). [Inst. Agric. Res. Nat. Tsing Hua Univ., China]

The disease developed better in dry and medium-moist soils than in wet soils. Medium-wet soils favoured early development of symptoms, and dry soils favoured rapid death of affected plants. The largest number of wilted plants occurred in soils with pH of 6.25-6.67. The disease developed better in poor soils than in rich soils and more wilted plants were found in soils that had received the least quantity of $(NH_4)_2SO_4$. Wilt-producing species of *Fusarium* can live in soil for at least 3 years. Fungi causing root-rot and wilt frequently overwinter on old stubble and other debris in the soil.

[1358] 635.656-1.81
ORMAN, A. C. **Growing green peas.** *Agric. Gaz. N.S.W.* 59, 1948 (65-68).

2 cwt./acre of super. gives increased yields. 5 cwt./acre of mixed fertilizer containing 5% of N, 10% of P_2O_5 and 5% of K_2O is recommended for heavy-rainfall areas or irrigated land. On light coastal sandy soils $2\frac{1}{2}$ cwt./acre of a mixture of 4 parts of super. and one part of $(NH_4)_2SO_4$ gives good results. Fertilizer should be placed in bands to one side of the seed.

[1359] 635.656-2.191:546.27
LEGGATT, C. W. **Germination of boron-deficient peas.** *Sci. Agric.* 28, 1948 (131-139). [Dominion Dept. Agric., Ottawa]

Pea seeds produced on B-deficient soils were normal in appearance but the small percentage which emerged developed abnormal sprouts. This condition was corrected by moistening the germination medium with a 0.01% borax solution or by dusting the seeds with borax.

[1360] 635.8-2.4
MANNS, T. F. **The vert-de-gris disease of the cultivated mushroom occurring in the United States.** *Plant Dis. Reprtr.* 31, 1947 (417-418). *R.A.M.* 27 (215).

In severe cases *Myceliophthora lutea* forms a mat beneath the casing soil of mushroom beds and causes losses of 50-75%. Heavily infested casing soil should not be used in supplementing composts. Injecting formaldehyde into high-pressure steam boilers at 75-100 lb. and forcing this steam through the soil has given promising results, but steam heat at 140°F for three hours was ineffective.

[1361] 635.946.69-1.411.2-1.86/7
DROUINEAU, G.; GOUNY, P. La fertilisation des cultures florales. Le rôle des fumures organiques en sols calcaires. [Fertilization of flower crops.—The function of organic manures in calcareous soils.] *C.R. Acad. Agric.* 34, 1948 (212-214). [F.]

Pinks are cultivated preferably on fresh land or on subsoil to which large quantities of mineral fertilizers are applied. Nutritional disorders, however, are liable to occur in the highly calcareous, P-deficient soils of the Midi that could only be adjusted by the addition of organic manure.

[1362] 635.964-1.841.7
ARMIGER, W. H.; FORBES, I.; WAGNER, R. E., JR., ET AL. Urea-form—A nitrogenous fertilizer of controlled availability: Experiments with turf grasses. *J. Amer. Soc. Agron.* 40, 1948 (342-356). [Bur. Pl. Indust., U.S.D.A.]

Various urea-form (urea-formaldehyde) materials were compared with standard sources of N in greenhouse experiments with Bermuda grass and perennial rye grass. The N of some of the urea-form materials produced more uniform plant growth than standard sources of N, owing to its initially low but subsequently accelerated rate of N availability. Crop yields were significantly greater in the late season when N was supplied as urea-form of moderately low solubility index. Urea-form materials stimulated greater root and crown development than did other sources of N. For direct application to turf, urea-form materials should be supplemented with readily available N to provide for growth during the first 20-30 days.

[1363] 635.964-2.7-2.951
FLEMING, W. E. Chlordan for control of Japanese beetle larvae in turf. *J. Econ. Ent.* 40, 1947 (932-933). [Bur. Ent. Plant Quar., Washington, D.C.]

In laboratory studies on *Popillia japonica* larvae in soil, 2 lb./acre of chlordan was as effective as 25 lb. of DDT. In field tests, a surface application of 5% chlordan dust at 10 lb. of chlordan/acre was compared with 10% DDT dust at 25 lb./acre. Chlordan gave 95.2% and 99.9%, and DDT 60.4% and 88.4% reduction of larvae after 4 and

17 weeks respectively. At applications up to 25 lb./acre, chlordan did not affect the colour or growth of various grasses and white clover.

[1364] 635.964-2.7-2.951.23
OMER-COOPER, J.; WHITNALL, A. B. M.; FENWICK, E. M. Notes on four species of *Coleoptera* attacking turf in the Eastern Cape Province. *S. Afric. J. Sci.* 44, 1948 (125-134). [Rhodes Univ., Grahamstown]

Effective control of white grubs of *Coleoptera* has been obtained by applying lead arsenate to the soil and turf at the rate of 1 oz./sq. yd.

[1365] 635.964-2.954: 577.17
MARTH, P. C.; MITCHELL, J. W. Selective herbicidal effects of 2,4-dichlorophenoxyacetic acid applied to turf in dry mixtures with fertilizer. *Bot. Gaz.* 108, 1947 (414-420). [Bur. Pl. Indust. U.S.D.A., Beltsville, Md.]

Dry mixtures of 1.5, 3, 6 and 9 lb./acre of 2,4-D and 600 lb./acre of 10-6-4 fertilizer were applied to weedy turf. 6 and 9 lb./acre of 2,4-D with fertilizer caused visible injury to the turf, but 1.5 and 3 lb./acre with fertilizer increased turf growth. 1.5 lb./acre of 2,4-D caused almost 100% weed eradication.

GEOGRAPHICAL

(4) EUROPE

(See also Abs. Nos. 1096, 1256, 1295, 1322)

[1366] (42)633.85-1.5
BLACKMAN, G. E. Oil as a farm crop. *J. Farm. Club Part 3*, 1948 (29-38). [Univ. Oxford]

Review and discussion of research on the cultivation and utilization in Great Britain of linseed, sunflowers, oil-seed poppy, soybean, safflower and rape seed.

[1367] (43)631.85
LEMMERMANN, O. Zur Frage der Phosphorsäure-Düngung. [A contribution to the problem of phosphate manuring.] *Ztschr. Pflanz. Düng.* 39, 1947 (97-114). [G.]

A discussion of studies affecting the use of P during the present scarcity. The main conclusions are: P must be used mainly on

those soils and crops which most need and can best utilize added P. The soils to receive P should be chosen on the basis of both their actual P_2O_5 content and the general condition of the crops on them. Enough available P_2O_5 should be applied to permit full use of the 40 kg./ha. of N which will be the average dressing to arable land, that is, about 20 kg. of P_2O_5 . The order of plant dependence on P_2O_5 is roughly: root crops, oil seeds, vegetables, lucerne, peas, beans, cereals and potatoes, but in view of the special nutritional value of potatoes and cereals during a near-famine these should, on land poor in P, receive equal priority with root crops for the obtainable P_2O_5 . Aspects of the use of rock phosphates on acid soils and of the mobilization of soil P_2O_5 by the addition of humus or the chalking of acid soils are shortly discussed. P fertilizers are most effective when placed at a depth of 15-30 cm.

[1368] (437)634.9-1.4
PELÍŠEK, J. Charakteristika lesních půd na bítešské rule v podhoří Českomoravské vysočiny. [The nature of the forest soils on Bites gneiss in the foot-hills of the Bohemian-Moravian plateau.] *Lesnická Práce* 26, No. 2, 1947 (41-52). For. Abs. 9 (280). [Cz.e.]

Seven main groups of soils for the region are recognized and include skeletal and podzolized soils, podzols and kaolinitic soils. They are very acid, tend to accumulate raw humus and most are deficient in Ca, Mg, K and P. A high content of soluble Al makes the kaolinitic soils toxic to forest growth.

[1369] (438)631.4
MUNNS E. N. Some Polish soil problems. *J. Soil Water Conserv.* 3, 1948 (85-87). [Forest Serv., U.S.D.A., Washington, D.C.]

An account is given of the soils and soil erosion, of the needs for fertilizers, lime, drainage and irrigation and of the efforts of the Polish people to introduce modern methods of farming.

[1370] (44)631.445.2
DUCHAUFOR. Les sols landais et le problème de leur amélioration. [The Landes soils and the problem of their improvement.] *C.R. Acad. Agric.* 34, 1948 (295-298). [F.]

Of these podzolic soils, those under heathers and conifers usually possess an

"Alios" or horizon formed of sand concreted by a cement of iron oxides and leached organic matter. The Alios horizon does not occur under birches, oak and other broad-leaved species, because the lower C/N ratios of the humus of these plants permits rapid mineralization, so that little organic matter becomes washed into the deeper parts of the soil. On soils without the Alios, the natural broadleaved undergrowth should be encouraged, while soils exhibiting the Alios require mixed planting of resinaceous and leafy trees of frugal needs. The use of N-fixing species such as the alder, whose debris has a narrow C/N ratio, deserves investigation.

[1371] (45)631.416
SCURTI, F. [Mitscherlich physiological-mathematical method for increasing soil productivity.] *Ann. Ist. Sper. Chim. Agrar. Torino* 15A, 1941 (11-48). C.A. 42 (3115). [I.]

The fertilizer requirement of 755 samples of Italian soils was estimated.

[1372] (485)631.62
HALLGREN, G. De statliga dräneringsförsök. [State drainage experiments.] *Svensk Jordbr.Forsk. Årsb.* 1948 (17-28). [Sw.]

In 1944 26.2% of the total arable area of Sweden was under drainage. Problems concerned with drainage have hitherto been dealt with by some of the experimental stations and private associations and were mostly confined to local problems. In 1947 the government allotted a quarter of a million Swedish crowns to research on drainage problems.

The main interest centres round the problem of how far the effectiveness of drainage may safely be decreased by alterations in either distances or depth or both of drains without loss in yields. Problems of a more theoretical kind include permeability of various soil types to water and the development of methods for estimating such permeability. A comprehensive soil survey forms the basis for selecting the sites, and the trials embody designs suitable either for long-term experiments covering one or more rotation periods or short-term trials elucidating local problems.—S.H.

(5) ASIA

[1373] (51)631.4
NAGATA, T. **Soils of the Tonkin region in north Indo-China.** *J. Soc. Trop. Agric. Taiwan* 15, 1943 (8-19). C.A. 42 (2701).

The area is a delta consisting of neutral or weakly alkaline red soil, weakly acid yellow soil and acid grey soil. On elevations yellow or yellow-brown lateritic soils containing a ferruginous layer occur.

[1374] (51)631.4
TAKAGI, M. **Types and chemical nature of soils on Hainan Island.** *J. Soc. Trop. Agric. Taiwan* 15, 1943 (112-122). C.A. 42 (2700).

The highland soils are grey or yellow-brown sands to sandy loams of granitic origin, rich in N and inorganic matter. The undulating plateau soils are either red-brown, well weathered clay or clay-loam basaltic soils or grey sandy and yellow clay granitic soils or brown clay loams. The alluvial plains are grey or yellow sandy soils depleted of humus and N by long cultivation.

[1375] (51)633.51-1.4
CHU, H-F. **A preliminary survey of cotton soils in China.** *Chin. J. Cott.* 1, 1948 (43-48). C.A. 42 (3113).

Cotton is planted in sandy loam, loam and sandy clay in the Yangtse valley where the soils are neutral or weakly acid and contain 0.1-0.13% of N, less than 0.15% of P_2O_5 and 0.3-1.0% of K_2O , and in the Yellow River valley where the soils are alkaline and contain less N and K_2O , but more P_2O_5 . Yields are lowest on the heaviest soils.

[1376] (52)631.4 : 551.432
ADACHI, M. **Microbiological studies on soils in Taiwan. XII. Forest soils on high mountains in the Mt. Nütaka and Mt. Ari districts.** *J. Soc. Trop. Agric. Taiwan* 13, 1941 (164-176). C.A. 42 (2701).

The soils were slightly acid with maximum pH of 6.2 and of high humus content.

[1377] (529.1)633.61-1.81
YANO, T.; CHIKAMORTI, K.; MIZUNO, S., ET AL. **Fertilizing experiments to determine the three-element requirements**

of cane sugar in the Zirin district, Taiwan. *J. Soc. Trop. Agric. Taiwan* 14, 1942 (243-253). C.A. 42 (2382).

The highest yield of cane sugar was obtained with 100:6:16 fertilizer.

[1378] (54)633.11-1.5
DORASAMI, L. S.; IYENGAR, R. S. **The cultivation of wheat in India and particularly in Mysore.** *Mysore Agric. J.* 22, 1943 (2-8).

Wheat is grown as a dry crop on black cotton soil, as a semi-irrigated crop on clayey loam and as an irrigated crop on sandy loam using tank or canal irrigation and on clayey loam using light irrigation. Wheat is grown in winter and, for the dry crop, land is kept uncropped in autumn; ploughing is rarely done, but the land is scarified with a blade harrow to prevent cracking and loss of moisture and for the eradication of weeds; manure is rarely applied. Irrigated wheat often follows a summer crop of groundnuts or onions. The land is ploughed and manured with 10-15 cartloads/acre of manure. Fields are flooded a day or two before sowing.

[1379] (569)631.4
NUTTONSON, M. Y. **Agroclimatology and crop ecology of Palestine and Transjordan and climatic analogues in the United States.** *Geog. Rev.* 37, 1947 (436-456) [U.S.D.A.]

The soils of the mountains of Palestine and Transjordan are of limestone origin or are volcanic basalt soils and both are deforested, overgrazed and eroded. Where the land is terraced, grain crops and irrigated fruit trees are grown. The valleys and plains are alluvial, heavy, of considerable depth, uniform structure and high water-holding capacity, and are productive. Drainage is usually poor and the soils are difficult to handle. Some are marshy and others peaty. The diluvial soils of the Jordan valley are formed partly from alluvial limestones and partly from sedimentary deposits on the former lake bed. They are deep and, where they are not too alkaline or where they can be leached of salts, they are suitable for fruit cultivation under irrigation. At the northern end of the Dead Sea, salinity has been reduced from 17% to less than 1%. The coastal plain of Palestine is mainly light

sandy soil containing 80% pure sand. It is poor in lime but is well aerated and free from excessive salinity. In the plateau regions of the Negeb and Transjordan there are extensive areas of loess which retains sufficient moisture to permit dry farming of wheat and malting barley in winter. Under irrigation, fodder, vegetables and fruits are grown. In the undulating coastal plain of the Negeb, where the loess is covered with sand, dry farming is possible in summer.

[1380] (593)631.4
PENDLETON, R. L. **The formation, development and utilization of the soils of the Bangkok plain.** *Nat. Hist. Bull. Siam Soc.* 14, No. 2, May 1947, pp. 40.

The soils exemplify many stages in the development of laterite from river-borne alluvium and include marine clays, young clays producing good rice, mature less fertile clays, senile unproductive soils and laterite. The rejuvenating effects of river action, of salt water and of river-borne silt on mature and senile soils are evident. Except on newly deposited silts, rice was the only crop grown until recently. Chinese methods of dyking, draining and ridging are being extensively used at Bangkok to adapt heavy wet clays for the production of fruits and vegetables.

(6) AFRICA

(See also Abs. Nos. 1269, 1329)

[1381] (62)631.4
KADDAH, M. T. **The soils of Egypt.** *Soil Sci.* 65, 1948 (357-365).

An outline treatment, including discussions of basin and perennial irrigation, drainage, the suitability of Nile water for irrigation and the causes of soil deterioration.

[1382] (65)631.4: 581.5
KILLIAN, C. **Conditions édaphiques et réactions des plantes indicatrices de la région alfatière algérienne. [Edaphic conditions and reactions of indicator plants in the esparto region of Algeria.]** *Ann. Agron.* 18, 1948 (4-27). [F.]

The relationship between steppe plants and their substrata was studied on the Terchoucha *daïa* of southern Algeria. The composition of the indicator plants, *Macro-*

chloa tenacissima, *Lygeum spartum*, *Artemisia Herb-alba*, *A. campestris*, *Salsola vermiculata* and plants on clayey calcareous and gypsum soils, and the characteristics of the soils on which they occur are described. Except in certain species on gypsum soils, the mineral composition of the indicator plants did not, in general, correspond to that of their medium but rather represented a specific characteristic. These results were in agreement with those obtained in other localities.

[1383] (68.01)631.851
FRANKEL, J. J. **Further remarks on the Langebaan phosphate rock.** *S. Afric. J. Sci.* 44, 1948 (95-97). [Natal Univ. Coll., Durban]

Most of the phosphate mineral in the Langebaan phosphate rock is a variety of carbonate-apatite (francolite) and is not all pure sub-microcrystalline fluor-apatite. The carbon is an essential constituent of the phosphate mineral and there is no evidence of the presence of free CaCO_3 .

[1384] (68.01)633.2.03-1.84
MEREDITH, D. B. D. **The effect of fertilizers on grasses in certain areas in South Africa, with special reference to nitrogen.** *Thesis, Univ. Witwatersrand* 1947, pp. 186. *Herb. Abs.* 18 (81). [Afric. Explosives Ltd., Johannesburg]

N is the most important fertilizer for South African grasses, at least in the eastern half of the country. Even in small dressings, N has a residual effect on herbage production.

[1385] (68.01)634.3-1.81
MES, F. F. **Fertilizing and manuring citrus orchards in Northern Transvaal.** *Citrus Grow.* 159, 1947 (8). *Biol. Abs.* 22 (174).

N and P fertilizers with manure and cover crops are recommended.

[1386] (683)63
COLONIAL OFFICE. **Annual Report on Swaziland.** *Colonial Annual Repts.* 1946, 1948, pp. 62.

Swaziland has scattered moderate-sized areas of good agricultural land with adequate rainfall for growing dry crops in ordinary years. With irrigation, mixed farming includes cotton, oil seeds, citrus and nuts.

[1387] (689.4)631.416 : 631.589
YOUNG, R. S. ; GOLLEDGE, A. **Composition of woodland soils and wood ash in Northern Rhodesia.** *Emp. J. Expt. Agric.* 16, 1948 (76-78). [Central Lab. Nkana, N. Rhodesia]

The soils of the copper-belt of Northern Rhodesia are buff to orange in colour and range from mixtures of clay and clay-sand to sandy soils. There is usually a horizon of ferruginous nodules in the lower levels. The soils are weakly acid, low in organic matter, deficient in bases and heavily leached by 40-50 inches of rain falling in 7 months of the year.

Over large areas a primitive form of agriculture called "chitemene" is practised. A small area is cleared, trees are piled and burned, the surface scratched with a hoe and crops sown in the wood-ash soil. Data on the chemical composition of soil and wood ash show that wood ash supplies many elements essential for growth, including Ca, P, K, Mg, S and Cu. Si, Al and Ti contents are much higher in the soil than in the wood ash.

(7) NORTH AND CENTRAL AMERICA

[1388] (729.8)63
COLONIAL OFFICE. **Annual report on St. Vincent, B.W.I.** *Colonial Annual Repts.* 1946, 1947, pp. 77.

A programme based on utilization and conservation of land resources and improvement of crop yields centres around the Camden Park Experiment Station where local problems are being investigated on a farming scale. The Land Settlement and Development Board, instituted in 1945, will make land available under a leasehold system. Co-operative farming on a large scale, home-stead small holdings and garden allotments for part-time workers are to be tried out.

[1389] (73)631.842.4
SCHOLL, W. ; MEHRING, A. L. ; WALLACE, H. M. **Consumption of ammonium nitrate as fertilizer in the United States.** *Chem. Engng. News* 26, 1948 (986-990).

The properties, explosion and fire hazards and use as a fertilizer of NH_4NO_3 are discussed. Data are presented on production and consumption in the U.S.

[1390] (73)633.491
HARDENBURG, E. V. **Current potato research in North America.** *Amer. Potato J.* 25, 1948 (183-190). [Cornell Univ., Ithaca, N.Y.]

A list of current potato-research projects, indicating the centres concerned. The general headings include: fertilizer, irrigation, soil management and weedkillers.

[1391] (75)631.67
CARREKER, J. R. ; LIDDELL, W. J. **Results of irrigation research in Georgia—part I.** *Agric. Engng.* 29, 1948 (243-244, 250).

A research project in supplemental irrigation was established in 1946 in view of a great increase in interest in supplemental irrigation in Georgia. Investigations include climatological studies, surveys of irrigation-water resources, surveys of systems, methods and equipment, studies of supplemental irrigation of pastures, vegetables and field crops.

[1392] (76)631.4
HARPER, H. J. **Acid soils in Oklahoma.** *Okla. Agric. Expt. Sta. Bull.* B-313, 1947 pp. 29.

The location of acid soils in Oklahoma is shown. The nature of soil acidity and factors affecting its development such as rainfall, slope, accelerated erosion, cultivation and natural vegetation are discussed.

INDEX TO AUTHORS

- Adachi, M., 1262, 1376
 Adams, J. E., 1294
 Adams, J. R., 1211
 Afzal, M., 1292
 Ahmad, N., 1293
 Alderfer, R. B., 1340
 Allison, F. E., 1220
 Alvarez Garcia, L. A., 1315
 Amundsen, R. F., 1302
 Anderson, J. C., 1260
 Andrews, F. W., 1261
 Anthony, R. D., 1326
 Arenz, B., 1209
 Armiger, W. H., 1362
 Athanasias, N., 1177
 Atkinson, H. J., 1125, 1128, 1224
 Ayers, A. D., 1272
 Azizbekova, Z., 1282

 Bac, S., 1146
 Baker, L. C., 1279
 Bălan, I. M., 1258
 Barbacki, S., 1251
 Barber, S. A., 1213
 Barbier, G., 1093, 1103, 1225
 Baribeau, B., 1288
 Barrons, K. C., 1351
 Baruah, H. K., 1266
 Beale, O. W., 1191
 Bear, F. E., 1102
 Beeson, K. C., 1099
 Bendixen, T. W., 1124
 Bernadowski, J., 1320
 Bertrand, D., 1107
 Bertrand, G., 1107
 Beylot, R., 1232
 Binkley, A. M., 1281
 Blackman, G. E., 1366
 Bohstedt, G., 1109
 Boisshot, P., 1225
 Bonnet, J. A., 1221
 Borden, R. J., 1299
 Bortels, H., 1162
 Bottini, E., 1092
 Bould, C., 1228
 Bradley, R. H., 1289
 Brookshier, F. A., 1190
 Brown, B. E., 1211
 Brown, J. W., 1245
 Brown, R. L., 1182
 Bryant, J. C., 1124
 Burrage, C. H., 1134
 Burris, R. H., 1161

 Câmpineanu, D., 1303
 Cannon, H. B., 1090
 Carpenter, R. W., 1218
 Carr, W. A. C., 1185
 Carreker, J. R., 1391
 Casas Campillo, C., 1164
 Chabannes, J., 1093, 1103
 Champion, H. G., 1349
 Chandler, F. B., 1337
 Chandraratna, M. F., 1352
 Chang, S. C., 1264
 Chapman, H. D., 1193, 1330

 Chen, C. T., 1265
 Chen, S.-M., 1199, 1200
 Cheo, C. C., 1234
 Chikamorti, K., 1377
 Christiansen, J. E., 1136
 Chu, H.-F., 1375
 Chubb, W. O., 1125
 Clarke, W. S., Jr., 1326
 Clements, H. F., 1151
 Conn, H. J., 1157
 Conrad, P. F., 1302
 Cook, J. A., 1219
 Coppenet, M., 1217
 Crang, A., 1280
 Cross, P. E., 1350
 Cuzin, J., 1309

 Dale, E. W., 1260
 Das, C. R., 1266
 Davies, E. B., 1203
 Davies, W. M., 1126
 De Jorge, W., 1137
 Delamare-Deboutteville, C., 1174
 Dijk, J. W. van, 1156, 1263
 Dimmick, I., 1157
 Doolittle, S. P., 1355
 Dorasami, L. S., 1378
 Dorph-Petersen, K., 1212
 Dorsman, C., 1188
 Doughty, J. L., 1153
 Doughty, L. R., 1152
 Drouineau, G., 1159, 1278, 1361
 Ducet, G., 1217
 Duchaufour, 1370
 Dufrenoy, J., 1115
 Du Plessis, S. J., 1342
 Duthie, D. W., 1152
 Dutt, A. K., 1138, 1139, 1140, 1141
 Dykstra, T. P., 1285

 Ellis, N. K., 1289
 Embleton, T. W., 1219
 Erdman, L. W., 1273
 Erikson, D., 1168
 Eriksson, E., 1108
 Evans, A. C., 1142

 Fang, C. T., 1357
 Farris, N. F., 1326
 Fenwick, E. M., 1364
 Fernandez, A. N., 1321
 Fernandez, R. N., 1321
 Filman, C. C., 1089
 Firtion, F., 1088
 Fischer, C. W., 1123
 Fleming, H. K., 1340
 Fleming, W. E., 1363
 Fluiter, H. J. de, 1314
 Foote, F. J., 1331
 Forbes, I., 1362
 Frankel, J. J., 1383
 Franz, H., 1173
 Fraser, G. K., 1087
 Fremouw, C. A., 1241
 French, G. W., 1351

 Frezzi, M. J., 1348
 Fuehlleman, R. F., 1238

 Gaddy, V. L., 1220
 Galpin, S. L., 1187
 Gane, J., 1207
 Gardner, R., 1184
 Garrett, S. D., 1253
 Gollege, A., 1387
 Goodwin-Wilson, R., 1089
 Gouny, P., 1159, 1278, 1361
 Gowans, K. D., 1331
 Grafton, Duke of, 1186
 Granhall, I., 1295
 Gray, E., 1172
 Greene, H., 1097
 Grossbard, E., 1113
 Guérin, H., 1214
 Gulati, A. N., 1293
 Gurbaxani, M. I., 1158

 Hall, T. D., 1270
 Hallgren, G., 1372
 Hamner, C. L., 1246
 Hansen, C. M., 1351
 Hardenburg, E. V., 1390
 Harper, H. J., 1098, 1100, 1202, 1392
 Havis, J. R., 1243
 Haynes, J. L., 1133
 Hébert, J., 1225
 Hellinga, J. J. A., 1305
 Henry, A. W., 1242
 Hernandez-Medina, E., 1316
 Hester, J. B., 1291
 Hickok, R. B., 1179
 Hill, H., 1090
 Hirvensalo, U. E., 1091
 Hobbs, C. H., 1319
 Holmes, E., 1244
 Hooton, D. R., 1294
 Humbert, R. P., 1150
 Hunter, A. S., 1319
 Hursh, C. R., 1144

 Ionescu, D., 1303
 Ionescu-Sisești, G., 1096
 Itallie, T. B. van, 1094
 Iversen, K., 1212
 Iyengar, R. S., 1378

 Jenny, H., 1106
 Jensen, V., 1307
 Johannson, Th., 1248
 Jordan, H. V., 1294
 Jorgensen, C. J. C., 1246
 Jung, A., 1155
 Junowicz-Kocholaty, R., 1169

 Kaddah, M. T., 1381
 Kappen, H., 1205
 Kardos, L. T., 1189
 Kastelic, J., 1249
 Keller, J. W., 1343
 Kelley, O. J., 1319
 Kelner, A., 1169

- Kephart, L. W., 1235
 Khan, A. J., 1292
 Khan, D. V., 1110
 Khristeva, L. A., 1112
 Kieser, M. E., 1280
 Killian, C., 1382
 Killinger, G. B., 1268
 Knight, P. M., 1279
 Koblet, R., 1236
 Koch, D. E. V., 1149
 Kocholaty, W., 1169
 Kohnke, H., 1179
 Kokkonen, P., 1145
 Koot, Y. van, 1167, 1327
 Kornilov, M. F., 1122
 Kotar, S., 1323
 Krische, P., 1201
 Krzyszkowski, J., 1204
 Kuron, H., 1155

 Lakin, H. W., 1127
 Lane, R. D., 1130
 Larsson, N. G., 1295
 Lefèvre, G., 1159, 1278
 Leggatt, C. W., 1359
 Lemmerman, O., 1367
 Lesesne, F. F., 1191
 Levick, R., 1128
 Liddell, W. J., 1391
 Lill, J. G., 1304
 Lin, J. F., 1264, 1265
 Lityński, T., 1095
 Loo, T.-Y., 1199, 1200
 Lundegårdh, P. H., 1121
 Lynd, J. Q., 1208

 McCalla, A. G., 1249
 McCalla, T. M., 1178
 McCann, L. P., 1339
 McComb, A. L., 1130
 McCubbin, W. A., 1286
 McElroy, L. W., 1249, 1250
 MacFarlane, C. S., 1341
 MacIntire, W. H., 1105
 MacLachlan, J. D., 1277
 McLean, J. G., 1281
 Manns, T. F., 1360
 Margulis, H., 1207
 Mariota, F., 1221
 Marshall, R. M., 1332
 Marth, P. C., 1365
 Mattson, S., 1108, 1196
 Mayer, I. D., 1179
 Mehring, A. L., 1389
 Mercer, W. B., 1185
 Meredith, D. B. D., 1270, 1384
 Mes, F. F., 1385
 Mibashan, A., 1197
 Michael, G., 1216
 Miller, E. H., 1131
 Miller, M. F., 1101
 Minshall, W. H., 1237
 Mitchell, J. W., 1235, 1245, 1365
 Mitscherlich, E. A., 1104, 1132
 Mizuno, S., 1377
 Moffett, A. A., 1311
 Moldenhawer, K., 1318
 Molnar, D. M., 1161
 Moore, R. E., 1136

 Morwood, R. B., 1333
 Muir, A., 1175
 Mulder, D., 1324
 Mulder, E. G., 1231
 Mulder, M. D., 1325
 Munns, E. N., 1369
 Munson, J., 1151
 Murray, S. M., 1270
 Musierowicz, A., 1204
 Muskett, A. E., 1296

 Nagata, T., 1373
 Nicholas, D. J. D., 1126
 Nightingale, G. T., 1233
 Nowotny-Mieczynska, A., 1198
 Nuttonson, M. Y., 1379

 Oertel, A. C., 1117
 Oliveira, A. J. de, 1116
 Omer-Cooper, J., 1364
 Opitz, K., 1255
 Orman, A. C., 1358

 Paauw, F. van der, 1231
 Paiva Neto, J. E. de, 1137
 Parkinson, T. L., 1279
 Parris, G. K., 1287
 Patry, L. M., 1128
 Pearse, H. L., 1336
 Peele, T. C., 1191
 Peiris, H. A., 1352
 Pelfšek, J., 1368
 Pendleton, R. L., 1380
 Pereira, H. C., 1312
 Pevzner, R. I., 1283
 Phillips, P. H., 1109
 Piettre, M., 1223
 Pillai, S. C., 1158
 Pinck, L. A., 1220
 Plöth, O. von, 1171
 Pochon, J., 1163, 1165
 Pollard, A., 1280
 Pope, A. L., 1109
 Pridham, A. M. S., 1267
 Prince, A. L., 1102
 Puh, Y. S., 1264

 Ragaller, F., 1306
 Rajan, S. V. G., 1222, 1227
 Rawitscher, F., 1148
 Reed, H. S., 1115
 Reichen, L. E., 1127
 Reinders, D. E., 1257
 Reitemeier, R. F., 1136
 Richardson, E. M., 1170
 Robertson, D. W., 1184
 Robinson, B., 1105
 Robinson, W. O., 1127
 Rozanova, M. A., 1086
 Russel, J. C., 1178

 Salgado, M. L. M., 1334, 1335
 Saloni, K., 1251
 Samuel, P., 1298
 Sanchez Marroquin, A., 1129
 Saru, N., 1303
 Sauchelli, V., 1194
 Scholl, W., 1389
 Schwartz, D., 1309

 Scurti, F., 1371
 Selman, I. W., 1356
 Shaw, E., 1114
 Shaw, H. R., 1302
 Shaw, W. M., 1105
 Sherwood, L. V., 1238
 Shuel, R. W., 1290
 Sikka, S. M., 1292
 Silberschmidt, K., 1308
 Simonson, H., 1250
 Slater, C. S., 1124
 Smith, D. D., 1183
 Smith, R. M., 1187
 Sowden, F. J., 1224
 Sparks, W. C., 1213, 1281
 Spinks, J. W. T., 1213
 Staples, R. R., 1180
 Stark, A. L., 1328
 Stauffer, R. S., 1271
 Stephens, C. G., 1176
 Steutel, H. E., 1118
 Stevens, N. E., 1338
 Stoa, T. E., 1317
 Strong, W. F., 1277
 Strzemski, M., 1147
 Sweet, R. D., 1243
 Świętochowski, B., 1226

 Takagi, M., 1374
 Tamayo, R., 1129
 Tandon, S. L., 1284
 Tchan, Y. T., 1163, 1165
 Telford, E. A., 1221
 Thompson, W. R., 1290
 Thorne, D. W., 1328
 Thorne, G., 1307
 Tims, E. C., 1353
 Tinsley, J., 1120
 Tirén, L., 1345
 Torstensson, G., 1195
 Toth, S. J., 1102
 Travaini, D., 1229
 Truscott, J. H. L., 1089
 Trussel, P. C., 1170
 Turk, L. M., 1208
 Tyner, E. H., 1187
 Tyner, L. E., 1252

 Ushikoshi, I., 1300

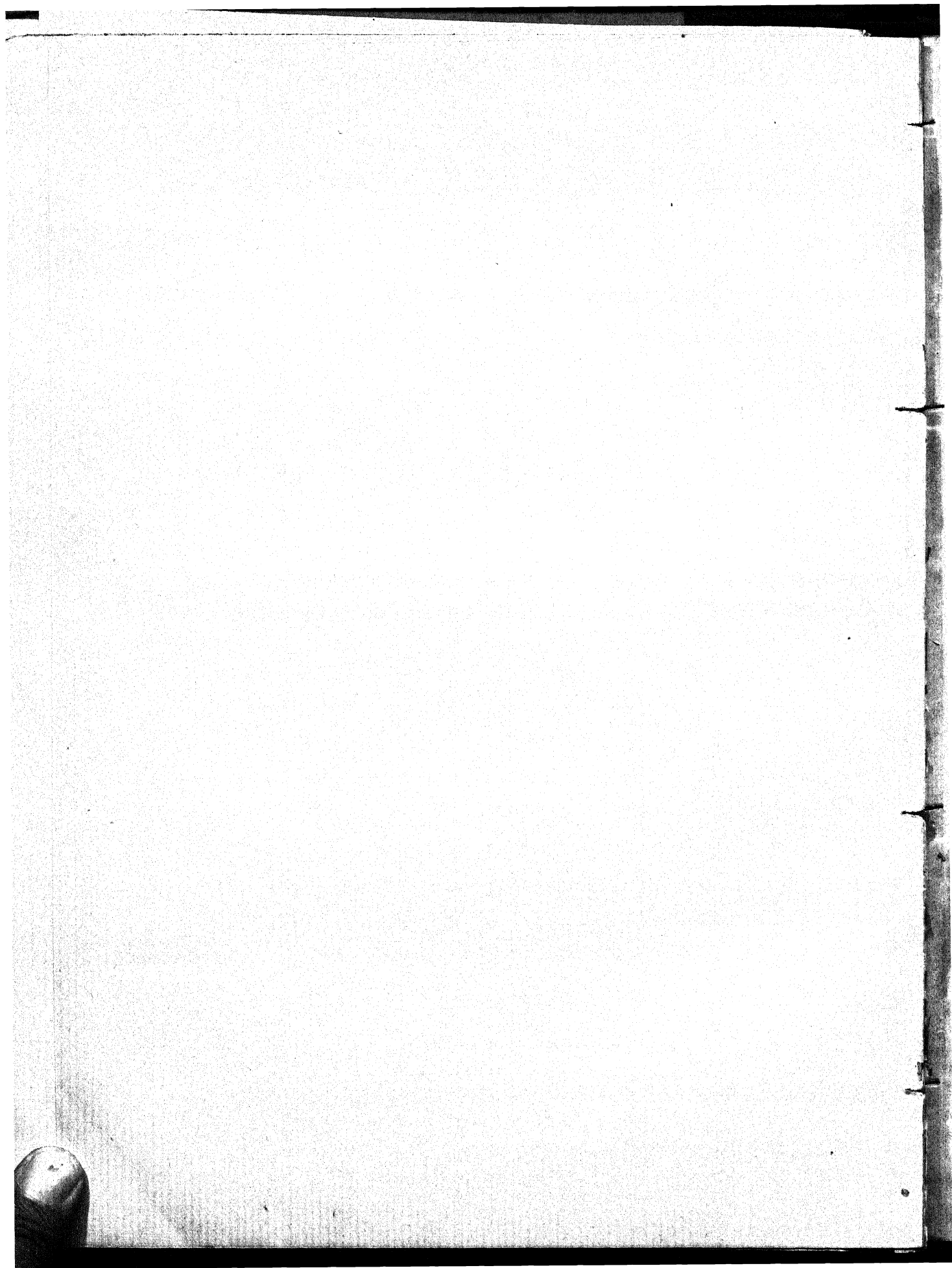
 Vahtras, K., 1108
 Velloso, J. F., 1239
 Venkatacharya, B. V., 1301
 Vlad, I., 1344
 Vladychensky, S. A., 1111
 Vlamis, J., 1106
 Vogelzang, W. L. M., 1156

 Wadhvani, T. K., 1158
 Wager, V. A., 1297
 Wagner, R. E., Jr., 1362
 Wallace, C. R., 1240
 Wallace, H. M., 1389
 Wallace, T., 1126
 Watkins, C. J., 1210
 Weaver, R. J., 1247
 Webley, D. M., 1166
 Weinmann, H., 1269
 Wellman, F., 1313

Wells, H. R., 1346
Wells, W. G., 1143, 1160
Wenzl, H., 1274
Whitnall, A. B. M., 1364
Whittaker, C. W., 1211
Wierszyłowski, J., 1323
Wiertz, G., 1167

Wilcox, L. V., 1192
Wilm, H. G., 1135
Wilson, P. W., 1161
Wisaksono Wirjodihardjo, M.,
1119
Woodburn, R., 1154
Wright, E., 1346

Yano, T., 1377
Young, R. S., 1387
Yu, T. F., 1357
Zhuravlev, I. I., 1347
Zimny, F., 1095



SOILS AND FERTILIZERS

Vol. XI

1948

No. 5

LINSEED

A widespread prejudice against linseed and flax on the score that these crops exhaust the soil and encourage weeds persists, notwithstanding the results of modern research which have disproved the arguments about soil exhaustion and discovered methods of dealing with weeds^(1, 10). It is probable that the reputation of linseed as an exhausting crop arose in the United States and Canada before the cause of flax wilt was discovered. Successive crops of linseed could not be grown on even the best land, and, as the cause of the wilt which developed was unknown, the erroneous conclusion was reached that flax was hard on the land⁽¹⁰⁾. During the past two decades⁽¹⁾ much attention has been paid in the United States and Canada to the breeding of varieties of linseed that combine resistance to wilt disease with an ability to give satisfactory yields under conditions of low summer rainfall. Other aspects of the development of linseed have also not been neglected and much has been learnt about the climatic, manurial and other requirements of the crop.

Climate. Results since 1941⁽¹⁾ have confirmed that linseed is primarily a crop suited to cool humid climates which favour the production of both seed and oil.

Linseed can be grown between latitudes 10° and 65°. It is grown as far north as Alaska and has been grown successfully in the Dutch East Indies where, however, the quality of the oil suffers at altitudes below 3500 feet. In India it is grown as a *rabi* or cold-weather crop under an average rainfall of 30-70 inches per annum. Indian varieties are slow-maturing with a long growing season suitable for autumn sowing in a mild climate⁽⁴⁾.

Linseed in the seedling stage is not easily injured by frost. Seedlings just emerging are the most tender, but even these will endure a moderate frost, especially if the soil is

moist and they are not further injured by drying winds. After the plants are 2-3 inches high and are hardened by exposure they will endure a temperature of 20-22°F. for a short time without injury. Linseed in a green-boll stage is readily injured by heavy frosts. The green seeds, which contain from 50 to 75 per cent of moisture, are killed by freezing temperatures, although the leaves and stems of the plants may be uninjured⁽⁷⁾.

Most of the linseed in the United States and Canada is grown for its drying oil, the quality of the oil being indicated by its iodine number. Canadian research has shown that the two major factors affecting the iodine number of linseed oil, are climate and variety⁽¹⁶⁾.

Studies in the United States on oil formation in linseed have made it possible to correlate the oil content of the seed and its quality with climatic factors. Deposition of oil in the seed occurs most rapidly from about the 5th to the 25th day after flowering. In hot dry weather the whole period of growth and ripening of the seed may not exceed 30 days, whereas in cool moist weather the period may extend to 50 days or more. Hot dry weather during the critical period of seed growth and oil formation results in a shrunken seed of low oil content and low iodine number of the oil. High temperatures and drought shorten the growth period of the seed and force early ripening, limiting the period of oil synthesis. Yield per acre is positively correlated with crop-year precipitation and negatively correlated with temperatures during the critical period. Seed size and oil content appear to be closely correlated, and for all varieties size and plumpness of seed appear to be the best indicators of oil content. Small-seeded varieties yield oils of higher iodine value than large-seeded varieties⁽⁶⁾.

Schmalfuss⁽¹⁷⁾ states that the ratio of saturated (low I value) to unsaturated (high

I value) fatty acids in the oil depends on the temperature conditions during the ripening of the seed, high temperatures favouring the formation of saturated fatty acids. High temperatures in the plant are produced by a lack of transpiration water, especially when combined with intense sunlight. Such conditions can be produced by an inadequate water supply, by forcing up yields by heavy manuring in dry seasons and by the specific action of certain anions present in fertilizer salts. Application of potash salts increases the iodine value of the oil, as a result, according to Schmalfuss, of the regulating effect of K ions on transpiration.

Varieties. There are at present several types of linseed:—(1) wilt-resistant short-fibre types with a high seed yield, (2) common or Russian (susceptible to wilt), (3) Argentinian (La Plata), (4) Indian, (5) Abyssinian, (6) golden or yellow seeded, and several more of minor importance⁽⁷⁾.

The old varieties such as La Plata have been superseded by such varieties as Bison introduced in the United States about 1931 and the Canadian varieties Redwing and Royal. Bison, Royal and a cross of Bison and Redwing all grow up to 3 feet in height and can be cut with a binder. Bison and Bison × Redwing have rather less oil but a little more protein than Royal. Yields of Royal are 34 per cent higher than those of La Plata which has the disadvantage that it ripens unevenly and tends to shatter⁽¹⁾. Redwing is a smaller-seeded variety than Bison. Its oil content is lower, but of higher quality than that of Bison. It is an early maturing variety suitable for the more Northern Canadian districts⁽¹⁶⁾.

Soils. Linseed can be grown on most soils which have an adequate supply of moisture. Light sandy soils, peaty soils and heavy clays are unsuitable⁽¹⁴⁾. In the United States it does best on the clay loam soils of the North Central States, where the summer temperature is moderate and the rainfall adequate (18-30 inches a year)⁽⁷⁾. 95 per cent of the linseed is produced in North and South Dakota, Minnesota and Montana⁽⁸⁾. In New Zealand a slightly acid medium clay loam is considered the most

suitable. In Canada the best-quality linseed is grown in those areas which produce wheat of average to low protein content⁽¹¹⁾.

According to Vinogradov⁽¹⁹⁾ the optimum pH for flax is 5.7-6.5, and according to Molfino⁽¹³⁾ it is 6.1-6.7.

Nutrient requirements. The nutrient requirements of linseed are not excessive⁽¹²⁾. In fact, an average linseed crop removes from the soil less P and K and only slightly more N than an average crop of wheat and oats⁽¹⁰⁾. That it is no more exhausting to the soil than other small-grain crops has been shown in Kansas, where maize yielded 8.5 bushels per acre more after linseed than after wheat. According to Lewis⁽¹²⁾ the amounts of nutrients removed from the soil by the total crop of flax are very similar to those removed by a crop of hay. The percentages of nutrients, particularly of N and P, in the seed and capsules are much higher than in the straw, the only exceptions being K, Na and Cl. In this connexion it may be noted that Jakobey found that the K requirement of fibre flax was nearly 50 per cent higher than that of oil flax⁽⁹⁾.

The development of new wilt-resistant varieties has made it possible to grow flax continuously, but a quick cover crop has then to be grown in summer and turned under before the land is prepared for the second crop of linseed. This practice can only be followed in mild climates, as in the Imperial Valley, California, where the seed is sown in the autumn and harvested in May. This method of growing flax continuously is best suited to irrigated land⁽⁶⁾.

Manuring. The manurial requirements of linseed are not exacting, lack of significant response to fertilizers having been recorded in Kansas⁽¹⁰⁾ and in Britain⁽²⁾. It is said not to need artificial fertilizers^(10, 15), except on P-deficient soils where a phosphatic fertilizer should be used. Where a P fertilizer is necessary it is best drilled with the seed, as is the practice in New Zealand. Broadcast dressings of P tend to encourage weeds.

Farmyard manure and lime should not be applied directly to linseed. Manure, which is liable to contain weed seeds, should be

applied to some crop ahead of linseed in the rotation. In Kansas 8 tons of farmyard manure several years before linseed in the rotation increased the yield by 2.74 bushels per acre. Lime applied directly to a linseed crop depresses its growth. Applying lime to pasture before ploughing up produced no ill effect⁽¹⁸⁾. Russian work, principally on podzolic soils, suggests the use of boron as a remedy against the harmful effect of lime.

Weeds. One of the causes of unpopularity of linseed, the belief that it encourages weeds, is justified to the extent that owing to its habit of growth and its slow germination it cannot compete with weeds. This disadvantage can be overcome by good agricultural practice, growing linseed on clean land or, if weedy land is unavoidable, the use of selective weed killers⁽³⁾.

Rotations. Linseed is highly resistant to wireworms and is therefore especially suitable as a first or second crop on ploughed-up grassland⁽²⁾.

In the United States and Canada it was formerly raised on newly broken sod, and is well adapted to growing on prairie sod while the sod is rotting⁽⁷⁾. Short-term leys are not favoured as predecessors of linseed as they are said not to create a sufficiently firm seed bed for linseed.

As a nurse crop for clover and grasses linseed is preferable to small grains because it does not shade the ground so densely and because the leaves fall off gradually as the crop matures, allowing sunlight to reach and harden the clover before the nurse crop is removed. Linseed can thus be seeded at the optimum rate without seriously interfering with the clover⁽¹⁰⁾.

It is best, however, to grow linseed in a regular crop rotation where the land is fairly free from weeds and fairly well supplied with N, as after a legume and where a firm seed bed can be prepared at little expense⁽⁶⁾. It does particularly well following maize after a leguminous crop, and should be sown in the maize stubble without ploughing. Where there is sufficient moisture linseed may also follow red clover⁽⁷⁾.

In the U.S. linseed follows beans, peas, maize, sugar beet and other row crops. Lucerne, clover, wheat or barley land is suitable provided it is kept free from weeds and well provided with moisture. Lack of moisture is a danger when linseed follows lucerne. Grain sorghum, sorgo, Sudan grass and millet should not be followed immediately by a linseed crop⁽⁶⁾.

Under New Zealand conditions linseed is generally sown on land out of grass, and good yields can be produced after a grain crop. Wheat is the most popular crop to follow linseed⁽¹⁸⁾.

Cultivation. One of the main requirements of linseed is a firm, compact seed bed.

In Kansas the crop is seeded a little later than oats. The land is ploughed in summer and autumn, and is then allowed to settle during the winter. In the spring the surface is worked with a disc, harrow, drag or roller until the seed bed is well pulverized, firm and smooth⁽¹⁰⁾.

In New Zealand October is considered to be the most suitable month to sow. If the seed is sown too early before the soil is reasonably warm, slow establishment of the crop favours weed growth. With late sowing there is danger of dry weather at the critical period of growth. A popular method in the past was the ploughing-in in the autumn of pasture 4-5 inches deep, rolling on the furrow and leaving the land in furrows till the early spring, then discing to a depth of about 3 inches and later working down to a fine tilth. The disadvantages of this method were that unless the land was worked to the bottom of the furrow, tunnels were left between the furrows and the soil lost moisture rapidly during a dry spell. The present method is skim ploughing in the autumn, with cultivation later in the season and deep ploughing in the early spring. After working with a grubber, harrow and roller a thoroughly firm seed bed results⁽¹⁸⁾.

Irrigation. Since flax is a shallow-rooted crop it responds best to frequent light irrigations. Where little or no rain falls during the growing season 4 or 5 irrigations will secure maximum yields. Where winter

rainfall occurs irrigation may be necessary to supplement the annual rainfall. As a firm, moist seed bed is needed, irrigation is necessary before sowing. Additional irrigation should not be needed for 30 days after sowing. Probably the most urgent need for irrigation is when the flax is in full bloom and for 2-3 weeks after the blooming period.

In the hot, dry climate of the Imperial Valley, California, it is considered good practice to supply water only when the crop begins to ripen. It is best at this stage to withhold irrigation in order to hasten maturity, as, if the soil is kept wet, blooming may continue indefinitely.

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SUMMARY OF REPORTS

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Basutoland.—Anti-erosion work. Grass leys for soil regeneration. Fertilizing with kraal manure, ash and super; comparison of maize yields from applications of kraal manure with and without addition of P fertilizer.

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Ontario.—Department of Agriculture.—*Ontario Agricultural College.*—Experiments with NH_4NO_3 as top dressing for winter wheat, hay and pasture. Investigation of the effect on crops of the source of K with and without Mg. Rates of application and methods of placement of K fertilizers for potatoes. Fertilizers for peas. Effects of lime and increasing amounts of P on soil reaction, soluble-P content and productivity of soil markedly deficient in lime and P. Soil fertility and lodging of grain. *Kemptville Agricultural School.*—Fertilizer trials and varietal response of cereals to fertilizer treatments. Residual effects of fertilizers. Pasture fertility treatments. Plough-sole fertilizer applications. Dates of application and incorporation of B, Mg and Mn on tomatoes. Fertilizer treatments for different potato varieties.

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mechanical and physico-chemical composition of the soil and additions of organic matter. The effect of cultural practices on the amount and distribution of moisture in the soil. Crop rotations for claypan soils. Effect of tillage practices on yields of maize and soybeans on different soil types. Characteristics of peats, mucks, sands and other soils requiring special management, and the effect of additions of K and minor elements. Evaluation of chemical tests for determining fertilizer needs of Iowa soils. Use of flame photometer for spectrochemical analysis of soil and plant material. Study of the control of potato scab in calcareous peat and muck soils. Study of soil-borne fungi affecting soybean. Vegetable cultivation on muck soils: influence of the overhead, rotary sprinkling system of irrigation on soil moisture; rotations; effect of fertilizers and cultural practices. *Corn Research Institute*.—Effect of tillage practices on maize yields on different soils. Soil fertility and crop rotations in relation to yields. Weed eradication.

Nevada.—Effect of fertilizers on yields and chemical composition of small grains and legumes grown on light-textured soils. Investigation of the quality of irrigation waters of Nevada. Bacterial wilt of lucerne.

New York State.—Effect of rotations on the incidence of root rot, quality and yield of peas and on the fertility and structure of the soil. Effect of fertilizer carriers, soil amendments and methods of application on the incidence of root rot and yield of peas. Effect of commercial fertilizers on the growth, production and quality of grapes. Rotation and fertilizer experiments with tomatoes; fertilizer placement. Sodium as a nutrient for beets.

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages. Where the Bureau has only seen an abstract, and not the original paper, no language indication is given.

Original (untranslated) titles of papers are only given where the Latin script is used.

Where more than one reference is given, the first is to the original paper, the others to notices in abstract journals. A key to the abbreviations used in the references is contained in the Bureau's *Bibliography of Soil Science, Fertilizers and General Agronomy*.

631.3 AGRICULTURAL EQUIPMENT

(See also Abs. No. 1595)

[1393] 631.333 : 631.862
DOBIE, J. B. **Liquid manure pumps and equipment.** *Calif. Agric. Ext. Serv. Circ.* 140, 1947, pp. 11.

A system for conserving the liquid part of manure consists of barn gutter, transport gutter, storage tank or pit, manure pump, power unit and disposal equipment. The liquid manure may be either pumped into the pipeline or head ditch and applied with the irrigation water or distributed by a tank wagon.

631.4 SOILS

(See also Abs. No. 1658)

[1394] 631.4
KELLOG, C. E. **Conflicting doctrines about soils.** *Sci. Mo.* 66, 1948 (475-487).

A counterblast to extremist views at present current on plant nutrition, soil erosion, humus, earthworms, ploughless farming, trace elements, and soil and health. The author shows that whatever real progress has been made in applied soil science has been made by the use of orthodox methods of investigation.

[1395] 631.4 : 549.1
DAL, P. H. **Methods for the investigation of clay minerals. I. The removal of humus from soil by electrolytic oxidation.** *Chem. Weekbl.* 44, 1948 (108-112). C.A. 42 (5143). [Landb. Hoogeschool, Wageningen]

The disadvantages of NaOCl for oxidizing humus are overcome by its preparation in

the presence of the sample. A suspension of 10 gm. of soil in 250 ml. of saturated NaCl solution is electrolysed with 1 amp. between a platinized Pt anode 2×7 mm. and a much larger Pt cathode. To decrease reduction of NaOCl the cathode is coated with $\text{Ca}(\text{OH})_2$ by cathodic treatment in dilute CaCl_2 solution. The electrolysis is continued for 24 hours at not over 50° . Foaming in the early stages is controlled by separating the cathode from the suspension by a diaphragm. The catholyte is later mixed with the suspension to restore neutrality. NH_4Cl is finally added to destroy excess NaOCl and electrolytes are removed. Tested on 3 very different soils this procedure lowered the humus content from as high as 15% down to 0.1%. Electrolysis beyond 24 hours results in excessive chlorate formation, but the suspension may stand additional time with the current off. A standard method of procedure using H_2O_2 achieved, even after a week, much less complete removal of humus. Further disadvantages of the H_2O_2 method are the possible decomposition of illite by H_2SO_4 and the production of NH_4 ions from organic N decreasing K fixation.

[1396] 631.4 : 549.1
DAL, P. H. **Methods for the investigation of clay minerals. II. The removal of free iron oxide from soil samples by electrolytic reduction.** *Chem. Weekbl.* 44, 1948 (123-127). C.A. 42 (5144).

The sample is suspended in 10% NH_4 -tartrate solution at pH 6.5 and electrolysed with gentle stirring for 24 hours with 500 milliamps. between a Hg cathode of 80 sq. cm. and a Pt anode. Ferrous ions formed at the cathode are reoxidized at the anode, but held in solution by the tartrate. The pH

risers to about 8.5. The soil is finally washed with NH_4 -tartrate solution followed by a little 0.05 N. HCl. This procedure avoids the introduction of Al ions and the exposure to extremes of pH involved in other methods. Using as criterion the constancy of the X-ray diffraction pattern and of the adsorptive capacity, the clay minerals of a soil high in illite were unaltered by this procedure.

[1397] 631.4: 551.432
BOGATYREV, K. P. [Sod mountain-forest soils as a special geographical form of high-mountain soil formation.] *Pochvovedenie* 1947 (704-713). [R.] [Dokuchaev Inst., Moscow]

Sod mountain-forest soils are suggested as a transition type in a vertical zonation between mountain-forest soils and the higher lying sod-meadow soils of the sub-alpine zone.

[1398] 631.4: 577.16
ROULET, M. A. [Investigations on vitamins of the soil.] *Experientia* 4, 1948 (149-150). C.A. 42 (5596). [F.]

Aqueous extracts of soil or natural manure added to synthetic media caused growth of *Saccharomyces cerevisiae* and *Phycomyces blak*, indicating that soil and manure must contain vitamins. Thiamin, biotin, pyridoxin, *p*-aminobenzoic acid and *i*-inositol were identified, their presence in soil being explained by the activity of auxo-autotrophic micro-organisms and higher plants. In samples of lake-chalk, biotin was demonstrated to a depth of 9 inches. The concentration of thiamin and biotin varies with depth and season. Biotin in the soil of pastures is increased by manure. The auxo-heterotrophic soil micro-organisms, and in some instances green plants, utilize these vitamins.

[1399] 631.4: 581.5
WILLIAMS, R. F. An ecological study near Beraking forest station. *J. Roy. Soc. W. Aust.* 31, 1944-1945, 1948 (19-27).

The distribution of the plant communities may be determined by edaphic factors such as the distribution of laterite and lateritic detritus, the soil type as determined by the underlying rock formations, the maturity of these soils and soil-water relations.

631.41 SOIL CHEMISTRY

(See also Abs. Nos. 1461, 1492)

[1400] 631.411.4: 546.56
MUSIEROWICZ, A.; KRZYSZOWSKI, J.; WONDRAUSCH, A. Studia nad wpływem wielkości dawki siarczanu miedzi na wysokość plonów ziarna, owsa i jęczmienia, uprawianych na dublańskim torfie niskim. [Studies of the effect of different rates of application of copper sulphate on the yields of grain of oats and barley grown on Dublany low-moor peat.] *Rocz. Nauk Roln.* 50, 1948 (51-70). [Pl.e.]

Field trials were made with oats and barley, a basal PK dressing being given and $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ being applied at rates varying from 40 to 8000 kg./ha. The smaller doses all increased yields of grain (and of straw, where recorded), the maximum yield being obtained from applications of the order of 400 kg. of the salt per ha.; higher doses reduced yields. In pot experiments with basal NPK dressing the copper salt, whether applied just before sowing or the year previous, showed a similar stimulation, but appeared less toxic at the higher rates of application. Many physico-chemical characteristics of the peat are recorded, including its natural Cu content at two depths; there was evidence that Cu from added CuSO_4 was slowly removed from the surface soil and migrated into the subsoil.—R.N.

[1401] 631.413.1: 634.989.84
BOUDRU, M. Influence des essences sur le pouvoir-tampon de la couverture morte et du sol. [The effect of different species on the buffer action of litter and soil.] *Bull. Soc. For. Belg.* 54, 1947 (298-307). For. Abs. 9 (415). [F.]

Studies of the litter under various trees showed that under beech and spruce it was becoming more acid, whereas under ash and more particularly under elm there was a reduction in acids, and basic materials were well represented in spite of leaching.

[1402] 631.414.1
ABRAMOVA, M. M. [Experiments on the study of the movement of capillary soil moisture on evaporation.] *Pochvovedenie* 1948 (24-32). [R.] [Dokuchaev Inst., Moscow]

Evaporation causes a capillary movement of moisture in liquid form towards the place of evaporation. The velocity of movement varies with the moisture content of the soil, and ceases when the capillary connexion is broken. For loesses and sandy-loam grounds this point corresponds to a moisture content of 10-11%. Above this point, called "the moisture of the breaking of the capillaries," a circulation of moisture in the upper layers of the soil takes place, consisting of a downward movement of water vapour which condenses at a certain depth, and an upward movement of liquid water. Simultaneously a slow drying-out of the surface layer occurs.

[1403] 631.414.2 : 549
MACÉWAN, D. M. C. **Complex formation between montmorillonite and halloysite and certain organic liquids.** *Trans. Faraday Soc.* 44, 1948 (349-367). [Rothamsted]

Adsorption complexes, formed by montmorillonite and halloysite with a variety of organic liquids, have been prepared and studied. In these complexes the organic molecules enter between the structural sheets of the clay mineral, and arrange themselves in parallel layers in the form of a two-dimensional liquid and, with certain exceptions, to lie as flat as possible. Montmorillonite complexes with one, two and three such layers are described, but halloysite complexes have not been obtained with more than one. The relationship of this type of adsorption phenomena to surface adsorption is briefly discussed.

The results obtained with the halloysite complexes provide direct confirmation of Bradley's suggestion (based on montmorillonite complexes) of CH-O bond formation to the oxygen-ion layer of the clay-mineral surface. Comparative data on CH-O bond lengths, derived from measurements on the halloysite complexes, are given, which show the effect of increasing electronegativity of the attached atom and increasing multiplicity of the bond in enhancing the electronegativity of carbon.

These complexes are useful in determining molecular configuration, e.g. results given here support the puckered structure for the cyclohexane ring and the *trans* structure for the 1 : 4-dioxane ring.—Author's summary.

[1404] 631.414.2 : 549
MACKENZIE, R. C. **Investigation of the ethylene glycol-water-montmorillonite system using the Karl Fischer reagent.** *Trans. Faraday Soc.* 44, 1948 (368-375).

Determination of the water and glycol contents of specially prepared samples of montmorillonite - glycol - water complexes, in conjunction with X-ray examination of the same samples, led to the following conclusions ;

(a) the (001) spacing of the complex remained constant at 17.1 Å. over a wide range of glycol and water contents ;

(b) the minimum amounts of glycol and water necessary to give this spacing were interdependent ;

(c) in the absence of water, 3.3 molecules of glycol per unit cell, in the form of a bi-molecular layer were required for production of the 17.1 Å. spacing ;

(d) in the first stages of replacement of glycol by water one molecule of glycol has to be replaced by approximately 6 molecules of water to maintain constant basal spacing.

—From author's summary.

[1405] 631.414.3.03 : 631.86
KLYCHNIKOV, V. M. **The effect of cultivation and fertilizers on the exchange capacity of podzol soils.** *Pochvovedenie* 1947 (736-740). [R.]

Cultivation and the use of organic fertilizers, particularly manure and peat, increased the exchange capacity of podzol soils. Cultivation alone lowered the exchange capacity, but growing lupins with the addition of organic manures increased the exchange capacity more than did cultivation and manuring. Lime together with manure increased the exchange capacity considerably more than did liming alone.

[1406] 631.415.1 : 631.414.3
CHERNOV, V. A. [The nature of soil acidity. II. The mechanism of the reaction of acid soils with solutions of neutral and hydrolytically alkaline salts.] *Pochvovedenie* 1948 (14-23). [R.] [Dokuchaev Inst.]

The titratable acidity of KCl-extracts of all horizons of podzolized soils was equal to the content of Al_2O_3 in the solution at equilibrium (both expressed as mg. eq. per 100 gm. of soil). It is concluded that the Al

appears in solution as a result of a direct exchange of K for Al absorbed on the soil colloids.

It is shown that the magnitude of the exchange acidity depends on the nature of the anion of the salt used as well as on the nature of the cation and the pH of the solution.

[1407] 631.415.36:631.51
MORANI, V. Le arature nel dilavamento dei terreni salsi. [Ploughing in relation to reclamation of salt soils.] *Ann. Sper. Agrar. Roma* 2 (n.s.), 1948 (167-172). [I.e.] [Sta. Chim.-Agrar. Sper., Rome]

In an area being reclaimed from the sea in Italy, it was found that the percentage of total salts and of NaCl in the uppermost 30 cm. increased considerably, while the subsoil salt contents decreased, between February and September 1947, in land left unbroken, or ploughed the previous autumn. After spring ploughing the salt contents tended to remain constant at all depths to 60 cm. These phenomena are imputed to capillarity, which brought about a rise of salt to the surface of soil undisturbed in spring, but was impeded by spring ploughing. The avoidance of spring ploughing is recommended in order to give full play to leaching of salts by rain.—R.N.

[1408] 631.415.36:631.62
FILOSOFOV, B. I. [Calculations of the critical regime of ground waters that salinize the soil.] *Pochvuovedenie* 1948 (81-86). [R.]

The problem of drainage as a method of control of secondary salinization is of considerable importance in the irrigation of saline soils. In order to provide suitable measures for the prevention of secondary salinization of irrigated soils it was necessary to have a method of evaluating the contributing factors for making these measures effective. The theory of the "critical regime" is said to provide the means for such an evaluation. The critical salt regime of a soil is a regime where there is slightly more salt being deposited than is being removed. Volobuev has shown that average depth of the water table during the vegetative period may be taken as an indicator of the state of the salt balance. The theory of the critical regime is based on a study of the

relation of the vertical migration of salts to the annual cyclic fluctuations of the level of ground waters. Calculations of the critical regime can only be arrived at by relating the curves of the water-table fluctuations to data on movements of water in the capillary fringe during the same period. The theory is illustrated by a diagram.

631.416 COMPOSITION OF SOILS

(See also Abs. Nos. 1457, 1465, 1481, 1533)

[1409] 631.416
BERGH, H. Moderna kjemiska jordanalyser. [Modern chemical soil analyses.] *Tidsskr. Norske Landbr.* 55, 1947 (71-81). [N.]

A popular account of how soil analyses can give indication of soil fertility and plant-nutrient requirements.

[1410] 631.416
SPIRHAZL, J. Půda jako heterogenní soustava. [Soil as a heterogeneous system.] *Vest. Čsl. Akad. Zeměd.* 21, 1947, No. 10, pp. 6. [Cz.f.]

A kind of classification of soil constituents is presented in which the highest category is represented by the solid, liquid and gaseous phases. The solid phase is subdivided into organic and inorganic parts. The organic part is further subdivided into living and non-living fractions each of which is finally subdivided into species and compounds. The inorganic part is similarly subdivided into its constituent chemical compounds. The liquid phase consists of water in various forms, solutions and oils, and the gaseous phase of the constituents of the soil air.

[1411] 631.416:631.81
JACOBSON, H. G. M.; SWANSON, C. L. W.; SMITH, E. Effect of various fertilizer cations and anions on soil reaction, leaching, nitrification of urea, and related characteristics in an uncropped soil. *Soil Sci.* 65, 1948 (437-460). [Conn. Agric. Expt. Sta.]

A sandy loam of pH 5.6 and of a weak fine-crumbs to single-grain structure was used. In May each lysimeter tank received Uramon at 200 lb./acre of N, together with either Ca, Mg, K or Na in combination with PO_4 , CO_3 , SO_4 or Cl, the same treatment

being continued for 5 years. The anions favoured nitrification of Uramon in the order given above, while the cations produced no marked differences. Uramon always increased the exchangeable H in the soils, the increase being greatest for the PO_4^- and least for the CO_3 -treated groups.

For the cation-fertilizer groups, total exchangeable bases in the soil after 5 years were greatest in the K-treated group, followed by the Mg, with the Ca and Na groups well below. Uramon, applied alone, gave the lowest figure. For the anion carriers, the CO_3 -treated soils gave the highest and the Cl-treated the lowest figures for total exchangeable bases. Replaceable K increased considerably in the K-treated soils, Na increased less markedly while Ca decreased in all tanks.

95% of the leached N and up to 90% of the leached Ca, Mg, K, Na and Mn came through during the first 6 months after fertilizing, while the loss of Fe, Zn, Al, CO_3 , SO_4 , Cl, PO_4 and silicate ions was greatest in the second 6 months. The PO_4 lost from the PO_4 -treated soils was many times greater than the small amounts lost from the other soils. The largest losses of cations and anions occurred from soils receiving Cl and SO_4 .

[1412] 63I.416.2 : 63I.81
PAAUW, F. VAN DER. Fosfaat- en kalibemes-
tingsonderzoek op de betuwse rivierklei met
behulp van zeer eenvoudig opgezette proef-
velden. [Results from very simple experi-
mental plots with phosphate and potash
on river-clay soils.] *Landbouwk. Tijdschr.*
60, 1948 (290-293).

The response to P was higher in calcareous than in non-calcareous soils. In calcareous soils the need for K was higher than in non-calcareous soils.

[1413] 63I.416.2 : 63I.414.3
BARBIER, G.; CHABANNES, J. Sur le
mécanisme de la fixation lente des phosphates
par une argile de sol. [On the mechanism
of the slow fixation of phosphates by a
soil clay.] *C.R.* 226, 1948 (2175-2177). [F.]

Study of the fixation of phosphate by various clays and clay minerals with only one exchangeable cation showed that progressive fixation is much less marked in pure than in soil clays and that equilibrium is

more rapidly reached in Ca kaolinite than in Ca montmorillonite. The exchangeable cation has little effect on the course of fixation, but modifies initial adsorption considerably. Acidification of the medium impedes initial adsorption and slows up fixation. After prolonged contact the fraction of fixed P_2O_5 which was extractable by dilute H_2SO_4 was higher for pure clays than for soil clays, probably due to the part played by $\text{Fe}(\text{OH})_3$ from which, in a neutralized mixture with SiO_2 gel, fixed P_2O_5 can be extracted only with difficulty.

[1414] 63I.416.2 : 63I.417
KAILA, A. Viljelyamaan orgaanisesta fos-
forista. [Organic phosphorus in culti-
vated soils.] *Valt. Maatalousk. Julk.* No.
129, 1948, pp. 118. [Fie.] [Agric. Expt.
Sta., Tikkurila, Finland]

In mineral soils about 40%, and in peat soils about 60%, of the P was in organic form. The proportion of organic P depended mainly on the C content of the soil. Soils tended to show a roughly constant C/organic-P ratio of the order of 100-150. Organic P seems to be fairly soluble. When the ratio is greater than 200 biological absorption of inorganic P into the organic system will occur. Mineralization of organic P is affected by a great variety of different micro-organisms, and is promoted by liming and apparently also by addition of fertilizers. Liming slightly increases the water solubility of organic P. Water-soluble organic P is available to micro-organisms. Addition of glucose promotes its microbial absorption, addition of N promotes its mineralization. Preliminary experiments indicated that soluble organic-P compounds are not available to plants.

[1415] 63I.416.2 : 63I.417
KHEIFETS, D. M. [A method of deter-
mining and the content of mineral and
organic phosphorus in certain soils
of the Soviet Union.] *Pochvovedenie* 1948
(100-112). [R.]

Organic P was extracted by successive treatments with 4 n. HCl and 4% NH_4OH . In solonchetses and serozems the organic-P content was only one-tenth of the total P, whereas in the various forms of chernozems it amounted to almost 50% of the total P.

In podzols, deep chernozem and red soils the relative amount of organic-P compounds decreased with depth, while that of the mineral P increased. A particularly sharp alteration in the relationship of the organic- and mineral-P compounds was observed in the profiles of strongly podzolized and red soils. The change occurred more gradually in grey podzolized and chernozem soils. In dark chestnut and grey soils the ratio between the two forms of P was much wider than in the other four soils and became completely stable at a depth of 50 cm. In all these soils except the serozems there is a good correlation between organic P and the amount of humus. It is suggested that phytin types of compounds were extracted with HCl and nucleic acids with NH_4OH .

[1416] 631.416.319
VINOGRADOV, A. P. [Arsenic in soils of the U.S.S.R.] *Pochvovedenie* 1948 (33-38). [R.]

The As content of 53 different soils of varying types from the Russian plain lay between 10^{-3} and $10^{-4}\%$. The mean content was $3.6 \times 10^{-4}\%$. A table is given showing the As content of soils from the U.S., Argentina, Switzerland, Italy, Germany, France and Japan. The average of 500 soils was $5 \times 10^{-4}\%$ —practically the same as the mean As content of rocks in the earth's crust. High contents ($2 \times 10^{-3}\%$) were found in regions of recent volcanic activity. In dry conditions As tends to accumulate in soils and may reach toxic amounts; in moist conditions the sulphide (realgar) tends to be oxidized and leached from the soil. Micro-organisms have been found in soil that produce gaseous As compounds, e.g., diethyl arsine. In the Russian soils the highest content of As was found in chernozems (A horizon), the lowest in tundra soils and podzols. Except for the highly organic soils which had abnormally low As contents, the As content varied with the organic content. There was no obvious relationship between the As content and the total colloid content or the Se and S contents. 5-10% of the As in soils is usually soluble in hot water.

[1417] 631.416.327
MUSIEROWICZ, A.; RUT, W. Materiały do poznania zawartości boru w glebach. [The

amounts of boron in soils.] *Rocz. Nauk Roln.* 50, 1948 (71-79). [Pl.e.] [Inst. Pedol. Warsaw]

B in the surface layers varied from 2.3 to 33.1 mg. per kg. of dry soil in 30 samples of soil of eleven types and of various reactions. In profile samples the B content decreased with depth. Average values for surface soils (B mg./kg.) were: leached sand 2.4, loamy sands 4.2, loess 4.9, degraded chernozem 7.8, Cretaceous rendzina 6.0, Tertiary rendzina 10.6, mountain soils 6.2, leached soils at foot of hill 9.4, high-moor peat (one sample) 5.5, peat bog (one sample) 16.2, three low-moor peats 22.7. In addition a chalk and a Tertiary limestone had 1.4 and 1.6 respectively.—R.N.

[1418] 631.416.7: 631.434
GAUCHER, G. Sur quelques conditions de formation des croûtes calcaires. [Some conditions for the formation of calcareous crusts.] *C.R.* 227, 1948 (215-217). [F.]

The widespread occurrence of calcareous crusts in North Africa is evidence of past hydrological activity, the crusts being formed by precipitation of CaCO_3 carried in solution to the place of deposition.

[1419] 631.416.8
MITCHELL, R. L. Trace constituents of the soil. *Int. Cong. Pure Appl. Chem.* 11, 1947. B.A. BIII (127).

Trace compounds are usually associated with specific minerals, the determining factor being the ionic radius of the compound and the lattice structure of the mineral. The amount of a trace element available to the plant is often unrelated to its content in the soil, a large proportion being bound up in the mineral lattice. Many trace-element deficiencies are due not to lack of the element in the soil, but to the pH being unfavourable to uptake by the plant.

[1420] 631.416.856: 631.414.3
ANTIPOV-KARATAEV, I. N. [Mobility of copper in soils.] *Pochvovedenie* 1947 (652-659). [R.]

"Reclamation disease" and other forms of Cu deficiency from which plants suffer on marsh soils are ascribed to the power of humus soils and montmorillonite clays to fix Cu ions irreversibly. It is concluded that Cu deficiency depends not only on the low

total content of Cu in soils but also on its availability, and Cu deficiency occurs in plants when the percentage of mobile Cu is less than 50% of the total Cu content of the soil (where the total amount is more than $2.10^{-3}\%$).

[1421] 631.416.862.1 : 631.85
OBOLENSKAIA, L. I. [The action of phosphates and lime on virgin soils with a high content of mobile aluminium.] *Pochvovedenie* 1948 (62-69). [R.]

Pot experiments with barley and flax (both very sensitive to Al toxicity) in acid podzolized soil showed a large response to P, especially in presence of Ca. Ca equivalent to half the hydrolytic acidity was nearly as effective as twice the quantity when NPK was given, but the larger dose was more effective when only NK was given. Ca acts mainly by neutralizing acidity and fixing Al, P acts partly by fixing Al and partly as a nutrient. For maximum yields, therefore, more P is required than is needed merely for fixing Al.

[1422] 631.416.871.1 : 631.462
FUJIMOTO, C. K.; SHERMAN, G. D. **Manganese availability as influenced by steam sterilization of soils.** *J. Amer. Soc. Agron.* 40, 1948 (527-534). [Hawaii Agric. Expt. Sta., Honolulu]

Steam sterilization of soil considerably increases exchangeable Mn. Cowpeas, tomatoes and Sudan grass were planted in 5 soils, sterilized and unsterilized, with Mn content ranging from very low to very high. Sterilization resulted in an increased uptake of Mn by plants; it retarded growth on high-Mn soils and improved it on low-Mn soils. In cowpeas grown on sterilized high-Mn soils symptoms were identical with those on cowpeas (1) grown on soil which had 1000 lb./acre of $MnSO_4$ added and (2) which were sprayed with 0.5% $MnSO_4$ solution. The change in the Mn availability in soils is a possible explanation of the improved or retarded growth of plants in steam-sterilized soils.

631.417 ORGANIC MATTER

(See also Abs. No. 1665)

[1423] 631.417 : 631.86
BALCHIKOVA, N. P. [Changes in the content and composition of organic matter of a typical serozem by continued

application of manure and mineral fertilizers.] *Pochvovedenie* 1948 (39-48). [R.]

Plots under irrigated cotton monoculture were treated for 17 years with manure and with an approximately equivalent NPK fertilizer. After 17 years about $\frac{1}{3}$ of the added organic matter remained in the soil, raising the C content by 50-60% and the N content by 40%, in comparison with the unmanured control. The C and N contents of the NPK-treated plot did not change.

Cotton utilized inorganic N more readily than organic N, but neither form was utilized completely. The unutilized organic N could be accounted for by the N accumulated in the top 50 cm. of soil; the unutilized inorganic N disappeared completely from the soil.

The organic matter of the manured and control plots was fractionated by Tiurin's method into (1) alcohol- and benzene-soluble matter, (2) humic acids, (3) fulvic acids, (4) substances hydrolysed by n. H_2SO_4 , (5) unhydrolysable humus. The proportions of the total C in the different fractions were approximately the same in both plots, indicating no change in the general composition of the soil-organic matter as a result of applying manure. The limitations of the fractionation as a method of characterizing soil-organic matter are recognized.

[1424] 631.417.1
SIDOROV, I. S. [The organic residues of soil.] *Pochvovedenie* 1947 (730-735). [R.]

The plant residues consisting of roots, stalks, straw, grain, etc., were determined by a method not described on the 10 fields of a 10-course rotation including 2 years under grass. From the figures it was calculated that each field received about 450 centners per hectare of plant residues in the course of the rotation. Roots comprised 25%, stubble 16%, and straw, stems, grain, leaves, etc. 59% of the organic residues. In the semi-arid conditions of the region (Kuban) moisture was the factor limiting decomposition which was accelerated by increasing moisture and also, initially, by manuring with 10 tons of ashes per ha.

[1425] 631.417.2
ENDERS, C.; SIGURDSSON, S. [Humic-acid formation under physiological conditions.] *Biochem. Ztschr.* 318, 1947 (44-46). B.A.A.III, 1948 (428).

Sixteen samples of humified material from various sources were examined for content of methyl glyoxal. Five samples contained methyl glyoxal, five probably contained it and six did not contain any.

[1426] 631.417.2
PONOMAREVA, V. V. [The determination and chemical nature of fulvic acid.] *Pochvovedenie* 1947 (714-723). [R.]

It was possible to separate from the illuvial humus horizon (B_h) of podzolized soils of the Kola peninsula a group of fulvic acids in the form of their ammonium salts. The organo-mineral gel freshly precipitated from this horizon at pH 5 was treated 3-4 times with $(NH_4)_2CO_3$ solution and heated for $\frac{1}{2}$ an hour on the water bath, causing the fulvic-acid fraction to go into solution as an ammonium salt. The solution was filtered through a Chamberlain filter, and the excess of ammonia removed by evaporation. A clear, intense yellow-orange solution was obtained. These fulvate solutions could be separated into fractions precipitated and not precipitated by $Ba(OH)_2$ or $Ca(OH)_2$. The latter is the lighter coloured, but contains a higher percentage of C than the other. The darker fraction predominated in the B_h horizon of podzolized soils, the lighter fraction in the A horizon of chernozems. Solutions of free fulvic acids were prepared by electrodialysing solutions or suspensions of NH_4 , Ba and Ca fulvates. The fulvic acids so obtained were sols which would not pass through a membrane filter. They were more dispersed than humic acids. The elementary composition of different samples varied very little. Typical data were:—C 44.5%, H 5.6%, O 48.7%, N 1.2%; pH 2.76; base-absorbing capacity 620 mg. eq., equivalent weight 160.

[1427] 631.417.2
LAATSCH, W. Untersuchungen über die Bildung und Anreicherung von Humusstoffen. [Studies on the formation and accumulation of humic matter.] *Ber. Landtech.* 4, 1948, pp. 31. [G.]

Evidence from the literature is presented to show that humic matter is formed either from lignin by autoxidation or from carbohydrates and protein by microbial decomposition and synthesis. Reference is made to Mattson and Koutler-Andersson's observation that during autoxidation lignin fixes ammonia irreversibly. The more oxygen and

ammonia that are absorbed the more resistant to chemical attack and the less soluble in acetyl bromide the product is. Products resembling humus can be prepared by oxidizing quinone, especially in the presence of ammonia, and the more oxygen and ammonia are absorbed the more closely does the product resemble natural humus. The resemblance is still closer if the reaction is carried out in a suspension of montmorillonite. The chemical criteria whereby a substance is judged to be a humic acid are (1) that it has a tannin character, (2) that it yields some maleic acid on treatment with ClO_2 , (3) that it yields a golden-yellow, ether-soluble chlorination product, (4) that its Ca and Ba salts are insoluble and that it has a cation-exchange capacity of 200-500 mg. eq. per 100 gm.

Experiments were made, inoculating chromogenic actinomycetes on glucose-peptone and glycerine-peptone-culture media. After a few days' incubation at 20-23°C. a coloured, humus-like substance was formed, soluble in alkali and insoluble in acid, with an exchange capacity of 229 mg. eq./100 gm. It contained, however, 9.5% of N, as compared with 2.5-5% in chernozem humic acid. It is suggested that chernozem humic acid may consist of a mixture of low-N lignin humic acid and high-N actinomycete humic acid. The tannin reaction (precipitation with gelatin from a NaCl solution) was weak with actinomycete humus. The chlorination product was yellow, insoluble in ether and slowly soluble in water. Production of humic matter was negligible when the source of N was inorganic $(NH_4NO)_3$.

A humic substance was prepared from pure cultures of the fungus *Stachybotrys alternans* that was soluble in alcohol and behaved like hymatomelanic acid. Other humic substances were obtained by the action of fungi on poplar leaves, and resembled actinomycete humus except that they gave a strong tannin reaction and were soluble in warm acetyl bromide. When shaken with montmorillonite powder, however, the poplar-leaf humus gave a product that was insoluble in acetyl bromide. The conclusion drawn from these experiments is that many organisms, especially fungi and actinomycetes, produce quinone derivatives *in vivo*, and these react with amino compounds to give humus.

[1428] 631.417.745.4
 FORSYTH, W. G. C. **Carbohydrate metabolism in the soil.** *Chem. Indust.* 1948 (515-519).

Processes of carbohydrate decomposition and polysaccharide synthesis in the soil are reviewed. During decomposition of plant residues cellulose disappears rapidly, and hemicelluloses increase relatively, especially the polyuronide fraction. The chief role of cellulose in soil seems to be to act as a source of energy for micro-organisms. Cellulose-decomposing organisms produce a resistant mucilage which consists of glucose-glucuronic polymers. *Rhizobium leguminosarum* and *Azotobacter chroococcum* produce similar mucilages. Fructosans (levans) are another type of polysaccharide formed in the soil by the spore-forming *Bacillus subtilis*, *B. megatherium* and *B. pumilius* (*mesentericus*). Non-spore-forming bacteria all give polysaccharides of the glucose-uronic type. These organisms, like the N fixers and unlike the levan producers, can grow and form gum on a wide range of sugars. Although these polysaccharides are fairly resistant to microbial attack a few organisms have been found capable of decomposing them.

In contrast to pathogenic bacteria soil bacteria produce polysaccharides formed of a very limited number of sugars, viz., D-glucose, D-fructose, mannose and uronic acids. The polysaccharides of fungal mycelium have not been studied.

Soil humus contains considerable amounts of carbohydrates. When hydrolysed they yield glucose, xylose, rhamnose, galactose and hexosamines. One fulvic-acid fraction was isolated which consisted almost entirely of a polysaccharide of constant composition from all the soils studied and yielded glucose, xylose, at least two other sugars and uronic acids on hydrolysis.

631.42 TECHNIQUE AND ANALYSIS

(See also Abs. Nos. 1480, 1511, 1596, 1597)

[1429] 631.423 : 631.421
 LEMMERMANN, O. Untersuchungen über die Feststellung des Düngungsbedürfnisses des Bodens durch Laboratoriumsmethoden im Vergleich mit Düngungsversuchen. [Studies concerning the determination of the fertilizer requirements of the soil by

laboratory methods in comparison with fertilizer experiments.] *Ztschr. Pflanz. Düng.* 38, 1947 (1-22). C.A. 42 (4699). [G.]

A light loamy sand unfertilized with P or K for 20 years was used. The Neubauer, citric-acid and Ca-lactate methods were used to determine the P requirement of the soil, and the Neubauer, NH_4NO_3 , citric-acid, Ca-lactate and NH_4 acetate + NH_4 oxalate methods to determine the K requirement. The values obtained by these laboratory methods for the P and K requirements of the soil agreed with those obtained from field and pot tests, provided that mean values were taken: individual soil samples showed considerable variation in P and K content and in pH, and crop yields on individual plots were often out of agreement with analyses made by laboratory methods.

[1430] 631.423.3 : 631.416.327
 LANDMARK, K. Borinnholdet i bergartstyper fra Vestlandet og Vest-Jotunheimen. [The boron content of rocks from Vestlandet and Vest-Jotunheimen.] *Bergens Mus. Årsb. Naturvitenskap. Rekke No. 5*, 1944, pp. 20. [N.e.]

The rock is fused with KOH in a Ni crucible, the mixture is treated with methanol, and the boric acid is distilled off as methyl borate and determined in the distillate by evaporation with turmeric and oxalic acid. The red dye thus produced is extracted with ethyl alcohol and the colour measured with a Pulfrich photometer.

The B content of igneous rocks was of the order of 0.0001 to 0.0005%. Two samples of mica schist had about 35 times as much.

[1431] 631.423.3 : 631.811.4
 OLSON, L. C. Determining the lime requirement of Georgia soils. *Ga. Agric. Expt. Sta. Circ.* 133, 1942, pp. 8. C.A. 42 (4299).

The BaSO_4 -bromothymol-blue method for determining soil pH is correlated with CaO requirement for different crops on Georgia soils.

[1432] 631.423.3 : 631.811.4
 RIERA, A.; BONNET, J. A. Laboratory recommendation about the quantity of lime to be added to a soil so as to reach a certain pH. *El Crisol* 1, No. 5, 1947 (3-5). C.A. 42 (705).

Mix 20 gm. of soil (1 mm. sieve) for 3 hours with 150 ml. of water and 20, 40, 60, 80 or 100 mg. of CaCO_3 ; determine the pH and plot it against the amount of CaCO_3 . One twentieth of the CaCO_3 added for a certain pH of a sample corresponds to as many tons of lime per acre required.

[1433] 631.423.3 : 631.811.4
VETTORI, L. [Determination of the need of soils for lime.] *An. Assoc. Quim. Brasil* 6, 1947 (167-180). C.A. 42 (5149).

Various methods for determining the exchangeable H in soils were tested. A modification of Parker's method proposed by Truog was exact and sufficiently simple. A rapid method based on Vageler's method was developed: 10 gm. of soil are mixed with 150 ml. n. $\text{Ba}(\text{OAc})_2$ of pH 7, occasionally agitated, left overnight, then 100 ml. of filtrate titrated with 0.1 n. NaOH (10 drops 3% phenolphthalein). The amount of 0.1 n. NaOH needed for the original $\text{Ba}(\text{OAc})_2$ solution is subtracted, and the result multiplied by 1.5 with the addition of 10%.

[1434] 631.423.3 : 631.811.4
WOODRUFF, C. M. Testing soils for lime requirement by means of a buffered solution and the glass electrode. *Soil Sci.* 66, 1948 (53-63). [Missouri Agric. Expt. Sta.]

The test is based on the measurement of the exchangeable -H content of the soil by combining use of the glass electrode and concept of depression of pH of a buffered solution. A mixture of 30 gm. of Ca acetate with 10 gm. of *p*-nitrophenol in 1 litre of water and neutralized with MgO forms a suitable buffer solution because of its compatibility with the soil, its rapid rate of reaction and the fact that when mixed with a 50% base-saturated soil in the ratio of 200 ml. per 100 gm. of soil, the solution produced a combination in which the calculated depression of pH was almost 0.1 pH unit for each mg. eq. of H present in the soil. Each tenth of a pH unit then had a CaCO_3 equivalent of 1,000 lb./acre-plough depth. This rate corresponds to addition of lime equivalent to the exchangeable H in heavy-textured soils, but for light-textured soils such a rate would exceed the exchangeable-H content by 43%. Overliming is prevented, however, by the slowly available coarse

material in the limestone. Results are in excellent agreement with liming practice.

The procedure for routine testing is described.

[1435] 631.423.4
VICENTE, J. G. [Determination of carbon in soils. II.] *Trab. Lab. Bioquím. y Quím. Univ. Zaragoza Sér. 2*, 1941 (245-254). C.A. 42 (3886). [Sp.]

An apparatus is described for determining C in soils by oxidizing the C with Cr_2O_3 using a HgSO_4 catalyst and collecting the liberated CO_2 in $\text{Ca}(\text{OH})_2$.

[1436] 631.423.4
RICKSON, J. B. A semi-micro combustion method for the determination of organic carbon. *Analyst* 73, 1948 (268-274). [Rothamsted]

A development of Spithost's modification of the Ter Meulen method, suitable for quantities of 2-6 mg. of C, is described. Spithost's aspirator is replaced by a small electric air pump and a simple flow meter is incorporated. The CO_2 from the combustion is absorbed in a new type of vessel containing 0.1 n. $\text{Ba}(\text{OH})_2$, the excess of which is titrated with HCl . A drop of secondary octyl alcohol in the absorbent considerably decreases surface tension and therefore bubble size. The apparatus is compact (70 x 30 cm. of bench space) and accurate to 1%; for soils it gives results that are closely similar to the mean results of several macro-methods. The amounts of N, S and Cl normally met with do not interfere with the determination.

[1437] 631.423.6
MAKSIUK, G. P. [The use of Heisler's calcimeter for the determination of carbonate carbon dioxide in soils.] *Pochvovedenie* 1948 (70-72). [R.]

A calcimeter is described which is weighed with the soil sample and HCl before and after mixing them; the CO_2 is allowed to escape from the apparatus and is determined by the difference in weight.

[1438] 631.423.7 : 544.6 : 631.413
HEIDEL, R. H. Direct photoelectric spectro-chemical determination of exchangeable bases of soils. *Proc. Iowa Acad. Sci.* 53, 1946 (211-223). C.A. 42 (4298).

Simultaneous analysis of the Ca, Mg, Na, K and Mn in the exchangeable-base series is accomplished by combining the use of the conventional spectrographic methods and instruments with the methods of flame photometry. The apparatus is described.

[1439]

631.425.22

TERLIKOWSKI, F.; SOZAŃSKI, S.; ZEMŁA, L. Zarys metody polowej szybkiego oznaczania wilgoci w glebie przy pomocy azotanu amonowego. [A tentative field method for determining water content of soil by use of ammonium nitrate.] *Rocz. Nauk Roln.* 50, 1948 (1-11). [P.l.e.] [Univ. Poznań]

10 gm. of mineral soil or 5 gm. of peaty or humous soil at 20°C. are put into a lagged vessel and the temperature observed to within 0.1°C.; using the thermometer as a stirrer, the soil is made into a paste with 2 ml. of saturated ammonium nitrate solution also at 20°C., followed by the rapid addition of 7.5 gm. of finely-powdered solid ammonium nitrate and constant stirring. The lowest temperature reached is noted. The drop in temperature corresponds (though not quite linearly) to the original water content in the soil. With a calibration table supplied the actual percentage of water can be ascertained from a given temperature reduction; thus a drop of 2.6° corresponds to 5% and one of 12.5° to 30% of moisture. The method has given fair agreement with moisture percentages over the range 2-64% as determined by drying over P_2O_5 ; in the majority of instances within $\pm 2\%$ of moisture. Some practice is required, especially with stiff soils, to incorporate the salt thoroughly so as to obtain a reliable reading, and modification of the technique may be necessary.

—R.N.

[1440]

631.425.66.005

RICHARDS, L. A.; CAMPBELL, R. B. Use of thermistors for measuring the freezing point of solutions and soils. *Soil Sci.* 65, 1948 (429-436). [Reg. Salin. Lab., U.S.D.A.]

A thermistor or "thermally sensitive resistor" as in the new type of resistance thermometer, Thermistor 14-B, is a small bead of semi-conducting material sealed to metallic electrodes and contained in a compact glass envelope. A freezing bath, sample tubes, thermistor mounting and bridge circuit are described, and procedure for

routine measurement of the freezing point of solutions is given, together with preliminary data on freezing-point measurements for soils. Results to date suggest the possibility of developing a rapid routine method for determining the equivalent soil-moisture stress in field samples.

[1441]

631.427.2 : 535.822.5

STRUGGER, S. Fluorescence microscope examination of bacteria in soil. *Canad. J. Res.* 26B, 1948 (188-193). [Univ. Münster]

If a suspension of soil is shaken with a solution of acridin orange (3, 6-tetra-methyl-diaminoacridin) in tap water, the humus components strongly absorb the dye cations, while bacteria intravitaly absorb only small amounts and appear green against a red background of soil under the fluorescence microscope. The most suitable concentration of acridinorange depends on the proportion of humus in the soil. For qualitative analysis the stained suspension is centrifuged and a small part of the centrifugate mounted in paraffin, while for counts a drop of the suspension is mounted in a counter of 20- μ depth and a counting ocular used. The preparations are examined under a luminous blue-light fluorescence microscope. Killed bacteria are not stained. The vitally stained bacteria can be further cultured in a drop of nutrient solution under microscopical control.

Tabulated data of counts by this method show that drying at 37°C. for 24 hours markedly reduces the number of living bacteria in garden soil.

[1442]

631.427.3

NICHOLAS, D. J. D. Use of chemical tissue tests in diagnosis of the mineral status of plants. *Int. Cong. Pure Appl. Chem.* 11, 1947. B.A. BIII (127).

By the use of a special technique soluble nutrients in fresh tissue are rapidly determined. A portable outfit is used in the field. Deficiencies of K, Mg, Ca, P, N or Mn and toxicity levels of Mn, Cl and Zn may be diagnosed. Tissue tests sometimes indicate impending mineral deficiency or toxicity prior to onset of visual symptoms. The relation between concentration of extractable nutrients and the time of sampling has been investigated for crops receiving various manurial treatments.

[1443] 631.427.3
 ROACH, W. A. **Study of mineral nutrition of plants by plant analysis, plant injection and measurement of the effect of curative treatment.** *Int. Cong. Pure Appl. Chem.* 11, 1947. B.A. BIII (127).

Mineral deficiency may be diagnosed by comparing analyses of leaves of satisfactory and unsatisfactory plants and by observing the effect of injecting selected nutrients into parts of the plant. The yields of broad beans, wheat and potatoes grown in South Kent were increased by spraying them with each of the trace elements Mn, Fe, Zn, Cu and Ni. The yield of potatoes was increased from 14 to 17½ tons/acre by spraying with 2½ lb. $MnSO_4$ per acre, to 16.65 tons by 2½ oz. of $ZnSO_4$ and to 19.35 tons by spraying with Mn + Zn.

[1444] 631.427.3
 TERLIKOWSKI, F.; FILUTOWICZ, A. O możliwości stosowania krótkotrwałych doświadczeń wegetacyjnych jako metody oznaczania żyzności gleb. [The possibility of simplifying the seedling method for determining soil fertility.] *Rocz. Nauk Roln.* 50, 1948 (12-30). [Pl.e.] [Univ. Poznań]

Use of perforated vegetation pots permits watering by continuous soaking from the bottom. Growth (dry or fresh weight) of the plants is a sufficient indication of the amount of K or P they have taken up from the soil. Tomato and *Galinsoga parviflora* are suggested as indicator plants suitable for the simplified method. Quantitative comparisons with results obtained by Neubauer's method are made, but no relationships between the two methods are explicitly stated and no calibration curves are supplied.—R.N.

631.43 SOIL PHYSICS

(See also Abs. Nos. 1462, 1475, 1495, 1575, 1688, 1694)

[1445] 631.431: 581.441.2
 VEIHMEYER, F. J.; HENDRICKSON, A. H. **Soil density and root penetration.** *Soil Sci.* 65, 1948 (487-493). [Univ. Calif.]

Soils ranging from fairly coarse sands to typical clay adobes were mechanically compacted at a moisture level just below saturation and at moisture levels of 4-13%, high

densities being obtained at both levels (up to about 2.0 for sands and 1.6-1.7 for clays). The surfaces were thinly covered with wax, and sunflower seeds were allowed to grow in loose soil above the wax seals. Threshold densities above which roots did not enter were about 1.75 for sands and 1.46-1.63 for clays. Failure to penetrate was more probably due to small size of pores than to lack of oxygen.

Soil densities obtained by settling with water were 1.56 for a loamy sand and 1.48 for a clay; roots penetrated all the soils tested. The moisture content of the compacted soils remained about the same as when first packed and the clays showed no tendency to crack.

[1446] 631.432
 KRIMGOLD, D. B. **Agricultural hydrology activities.** *Agric. Engng.* 29, 1948 (205-207).

Reports on the activities of and the general lines of future research envisaged by the American Society of Agricultural Engineers subcommittees on run-off, watershed studies, water-plant-soil relationships, ground water and evaporation.

[1447] 631.432
 YOUNG, V. D. **Rainfall—runoff relationships for small watersheds.** *Agric. Engng.* 19, 1948 (212-214). [S.C.S., U.S.D.A.]

Procedures used at present in the analysis of records from watersheds within the Ozark Highlands land-resource area are shortly described. The "rational" and the "recurrence interval" methods are used for calculating approximately the probable 10-, 25- and 50-year peak rates of run-off. These probable peak rates for individual watersheds may be extended to give peak rates for a wide range of watershed sizes and types of cover by the use of a "size-factor curve" obtained by plotting instantaneous peak rates of storm flow of streams draining various-sized areas within the resource area as a whole. Curves relating rainfall to actual amounts of run-off for any given group of months—such as a 5-month growing season—for a given watershed may be used, in conjunction with long-term rainfall records of a meteorological station representative of the region, to give probable minimum run-off amounts which may be expected once in 5, 10 or more years.

[1448] 631.432:631.415.3:631.58
ZONN, S. V. [Salt conditions of ground waters and soils under conditions of trench agriculture.] *Pochvovedenie* 1947 (477-487). C.A. 42 (3887). [R.e.]

In the sands of the pre-Aral region, ground water may become salinized in its movement in trenches through marl beds at depths of 20-30 cm. The composition of the salts in different areas of the sand region and at various depths of trenches is recorded.

[1449] 631.432.2:631.51
KOLESNIK, I. L. [The effect of different systems of surface cultivation of fallow on the conservation of soil moisture.] *Pochvovedenie* 1948 (127-132). [R.]

Formation of alternate layers of loose and consolidated soil preserved 15 to 20% more moisture than when the soil was loosened to a uniform depth by a single cultivation. The alternate layers were made by first cultivating to a depth of 12 cm. with subsequent cultivations to depths of 8 cm. and 4 cm., the soil being consolidated at these different depths by the sole of the cultivator.

[1450] 631.432.3
SLATER, C. S. The flow of water through soil. *Agric. Engng.* 29, 1948 (119-124).

An outline mathematical treatment of soil-water flow as affected by gravitation and capillarity.

[1451] 631.432.4:581.032.3
KOCHERINA, E. I. [The wilting point of plants.] *Pochvovedenie* 1948 (49-61). [R.] [Soil Inst., Acad. Sci., U.S.S.R.]

The wilting point depends mainly on the mechanical composition of the soil, and to a lesser extent on the organic-matter content. The highest wilting points are found on strongly hydrophilic soils, such as solonchets. On solonchets, wilting points of 16% were obtained, on heavy loams 11.5% and on sands 2.8%. Lower wilting points were found in the lower and less humous than in the surface horizons of soils. The ratio of the wilting point to the maximum hygroscopicity varied from 1.6 to 1.1.

[1452] 631.432.5:631.434
ZUEV, L. A.; GAPON, E. N. [Adsorption of water vapour by soils.] *Pochvovedenie* 1948 (113-120). [R.]

Using the same method as that described in an earlier paper (*Pochvovedenie* 1943, No. 8) where the adsorbents were bentonite, kaolin and humic acid, the adsorption of water vapour was studied in two soils (chernozem and podzol) saturated with Mg, Ca, Na and H cations. In one experiment the soils were saturated with one cation at a time, in other experiments they were saturated with two cations Ca:N=2:1 and 1:1 and three cations Ca:Mg:Na=1:1:1 and 7:2:1 respectively. The structure of the soil was the most important factor in the absorption of water vapour by the soil, the cations only affecting adsorption indirectly by altering the soil structure. A soil containing 33% of a Na ion behaves like a soil completely saturated with Na.

[1453] 631.434
MCCALLA, T. M. The stability of soil structure against falling water drops containing different dissolved materials. *Trans. Kans. Acad. Sci.* 50, 1947 (349-355).

The soil-structure stability of 0.15-gm. lumps of 2 soils against falling drops of water containing different substances in solution at concentrations up to 10,000 p.p.m. was investigated. Water containing HCl, H₂SO₄, acetic, boric or citric acid, NH₄OH, NaOH, NaCl, NaNO₃, Na₂CO₃, NH₄NO₃ or MgSO₄ gave the same results as distilled water.

With water containing the organic substances Vinsol (a synthetic organic resin), dodecyl dimethylamine sulphate or dodecyl dimethyl benzyl ammonium chloride (surface-active substances) more drops were required to break down the structure than when distilled water was used.

The spray materials DDT, pyrophyllite, 2,4-D, wettable sulphur, Bordeaux mixture and ferric-dimethyl dithio carbonate, filtered through cheesecloth where necessary, gave the same results as distilled water. The higher concentrations of the 25% emulsion of 1068 and the 50% wettable BHC affected soil stability less than distilled water.

[1454] 631.434:631.435
CLARKE, G. B. Effect of mechanical composition and nitrogen content on the water-stable aggregation of several soils. *Aust. J. Coun. Sci. Indust. Res.* 21, 1948 (51-58).

The effect of clay, silt and fine-sand content on water-stable aggregation was

studied in seven soils. A significant positive effect of clay and an insignificant effect of sand were found in all cases. Five of the seven soils examined showed a significant positive effect of silt. There was no significant difference between the effect of 5- μ and 2- μ clay on water-stable aggregation. The statistical data indicated a curvilinear relationship between water-stable aggregation and mechanical composition. No significant relationship was found for the effect of N content on water-stable aggregation.

[1455] 631.434 : 631.461
MOLINA, J. S.; SPAINI, L. S. Influencia de un coloide organico sobre la estabilidad en agua de los agregados de diversos suelos argentinos. [The effect of an organic colloid on the aggregate stability of different Argentine soils in water.] *Rev. Argent. Agron.* 15, 1948 (113-116). [Sp.]

6 subsoils and 2 soils of different nature and pH were treated with 0.1% by weight of an organic colloid prepared by incubating *Pseudomonas* sp. on filter paper resting on silica gel, the colloid being diluted with water and mixed with the air-dry soil. The treated soils were markedly more stable than the untreated ones.

[1456] 631.435 : 631.412
STANGANELLI, M. Relazioni intercorrenti fra alcune proprietà fisico-meccaniche e fisico-chimiche dei terreni siciliani. [Some relationships between physico-mechanical and physico-chemical properties of Sicilian soils.] *Ann. Sper. Agrar. Roma.* 2 (n.s.), 1948 (145-165). [I.e.] [Sta. Sperim. Granicolt., Catania]

Values of single determinations of exchange capacity, loss on ignition, water-saturation capacity, clay and silt, and "humus" on 90 soils of origin not specified in the text, are presented. Regression coefficients and crude and multiple correlations between exchange capacity, loss on ignition, saturation capacity, clay (Stanganelli method) and "humus" are given, with statistical estimates of significance. The exchange capacity (E) was calculated for all soils from the equation $E = 0.5192 \times \text{clay} + 3.2893 \times \text{humus} + 0.4123$ and the saturation capacity (S) from the equation $S = 0.4239 \times \text{clay} + 3.7447 \times \text{humus} + 30.2339$, the clay being determined by Stanganelli's method. Fair agreement with observed values of E and S was obtained

in most cases, positive and negative deviations being about equally frequent. The values 280 ± 57 and 1942 ± 128 were obtained for the equivalent weights of humus and clay respectively.

It is suggested that the observed correlations between clay and physico-chemical properties indicate that the operations performed on the soils yielded a true picture of their particle-size distributions, and that an arbitrary pre-treatment may destroy or disrupt some soil components and thus falsify the mechanical analysis. The exchange capacity of nine of the soils was calculated by application of Stanganelli's formula using the clay values obtained by the Robinson method of mechanical analysis. These soils were selected for their presumed proneness to injury by the treatment in Robinson's method, and all gave much lower clay percentages by Robinson's method than by Stanganelli's. E as thus calculated was uniformly much lower than the observed values.—R.N.

631.44 SOIL TYPES

(See also Abs. Nos. 1664, 1665, 1667, 1689, 1699)

[1457] 631.445.2 : 631.452 : 631.414.2
DOBZAŃSKI, B. Rola frakcji koloidalnej w szczerku zbielcowanym przy magazynowaniu składników pokarmowych dla roślin. [The role played by colloidal particles in storing plant nutrients in podzolized loamy sands.] *Ann. Univ. Mariae Curie-Skłodowska*, 2E, 1948 (1-18). [Pl.e.]

Chemical analyses of the humus and eluvial horizons of podzolized loamy sands have shown that (1) the smallest soil fractions (<0.002 mm.) play the main role in storing plant nutrients, (2) the constituents of colloidal fractions serve as an index to soil fertility, and (3) podzolization decreases the amount of K, Ca and other constituents in the eluvial horizon.

[1458] 631.445.2 : 634.9
DUTT, A. K. The influence of forest types on the degree of podzolization. *Indian Forester* 73, 1947 (495-498).

Conifers, owing to the relatively low content of Ca in their litter, are more liable to cause podzolization than are base-rich hardwoods.

[1459] 63I.445:3
 ANTIPOV-KARATAEV, I. N. [Brown and brownish forest soils.] *Pochvovedenie* 1947 (697-703). [R.]

Two types of brown forest soils are distinguished by two Russian words for brown—(1) *buryi* and (2) *korichnevyi*. (1) is the type widely distributed in western Europe and parts of the U.S.A. and known by the German name *Braunerde*. It develops under a mean annual temperature of 7-10°C. and an annual rainfall of 500-800 mm. (2) occurs in the U.S.S.R. in Tadjikistan and the Caucasus under a mean annual temperature of about 9°C. (varying from -6° in winter to +21.5° in summer) and an annual rainfall of 1100-1400 mm. The vegetation is shrub-meadow or shrub-forest. The pH of these soils does not fall below 6.5. Some sub-types are calcareous. In mineralogical composition and general characteristics the soils resemble the chernozem type.

[1460] 63I.445:4 : 63I.48
 BOLYSHEV, N. N. [Genesis of ordinary chernozems in a part of the West Siberian plain.] *Pochvovedenie* 1947 (660-668). [R.]

Two stages are distinguished in the development of these chernozems. The first stage was affected by the earlier soils which developed in a desert climate with only a slight accumulation of organic matter and slow leaching of salts from the upper layer, their characteristics being those of the present brown or chestnut soils. Some of these characteristics are still to be found in the yellow-brown sections which are relics of earlier soil formation during the post glacial quaternary era. The second stage of development has been influenced by the present conditions of the region and is characterized by the formation of cracks, leaching and accumulation of salts in the illuvial horizons and formation of organic matter in the upper layer of the soil profile.

[1461] 63I.445:7 : 63I.415:7
 PORTÈRES, R. Les plantes indicatrices du niveau de fertilité du complexe cultural edapho-climatique en Afrique tropicale. [Plants indicating the fertility level of the edapho-climatic cultural complex in tropical Africa.] *Agron. Trop.* 3, 1948 (246-257). [F.]

A detailed report of observations. In forest soils, in the cacao zones of the Gold and Ivory Coasts, fertility is indicated by the common occurrence of: *Hillieria latifolia* H. Walt.; *Trema guineensis* Ficalho, in forest clearings on the heavier soils rich in organic matter; *Spathodea campanulata* Beauv., in old reconstituted forest not suited to heavy and long cultural use; *Aframomum Daniellii* K. Sch. on good light humiferous soils subject to rapid degradation on destruction of their cover. Less fertile forest soils often carry *Musanga Smithii* R. Br. and poor soils, unsuited to coffee, often carry *Harungana madagascariensis* Lam. *Momordica foetida* Schum and Thonn. is suited to K-rich soil.

In savanna soils, in Senegal, *Borreria Ruelliae* Hutch. and Dalz. characterizes very degraded groundnut soils, while an increase of *Cassia occidentalis* shows a restoration of fertility, such that in its presence one year of fallow is sufficient as against 3 or 4 in its absence. *Cenchrus biflorus* shows good soil for groundnut and penicillary millet in the dry zones of Senegal and for millet in West and Central Sudania, as does *Bauhinia reticulata* between the isohyets 400 and 700 mm. Soils carrying trees of *Faidherbia* (*Acacia*) *albida* A. Chev., an excellent restorative on used light soils, are fertile, and 50 trees per hectare may be left growing to the advantage of millet etc. *Combretum micranthum* appears on lateritic cuirasses, visible or hidden, and on dry hot sands. Parasitic Scrophulariaceae (*Striga* spp.), being sensitive to nutrient deficiencies in their hosts, are very important in determining the degree of soil degradation. The first appearance of *Striga* marks the moment when a less exiguous crop must be grown, or the land fallowed. *Ramphicarpa fistulosa* is of similar significance.

In cultivated coffee soils of the High Plateaux of the Cameroons, *Galinsoga parviflora* Cav. indicates the higher levels of fertility: its disappearance, under unshaded conditions, marks the limit of economic coffee cultivation by Europeans. In decreasing order of soil fertility follow *Commelina nudiflora* L., *Digitaria horizontalis* Wild., *Paspalum scrobiculatum* Stapf and *Rhynciletrum roseum*, a pure growth of which indicates unsuitability for economic coffee cultivation by natives. With *Albizia melanocarpa* used to provide an artificial shade, however,

Galinsoga may occur sporadically and *Commelina* in considerable quantity even in soils too unfertile for economic native cultivation.

Of various significance are: *Pteridium aquilinum* var. *lanuginosum*, a sclerophyll of poor light degraded soils and of degrading soils; *Sporobolus pyramidalis* P. Beauv., which indicates an excessive pasturing of cattle, and *Oriza Barthii* which, when invading a crop, indicates degraded land, but which, where it occurs in masses in deltas, indicates fertile areas suitable for floating rice, *O. glaberrima*.

[1462] 631.445.72 : 631.434
KRISHNA, P. G.; PERUMAL, S. **Structure in black cotton soils of the Nizamsagar project area, Hyderabad State, India.** *Soil Sci.* 66, 1948 (29-38). [Dept. Agric., Hyderabad Deccan]

Black soils in the Nizamsagar Irrigation Project consist of sandy clays, clay loams and clays. The surface soil is granular to crumbly above and laminated or fine platy from 3 to 8 inches. The deeper black cotton soils in the granitoid gneissic areas have in their subsoils a distinctive structure which does not fit into any commonly recognized form and which is termed a "lentil", as it closely resembles a lentil seed in shape. In soils where this structure is but feebly developed, only the upper part of each aggregate is well defined and is termed a convex lentil; where the structure is well developed with a double-convex-lens shape it is termed a bi-convex lentil. The lentils are stable and not easily broken, measure about 8×5 inches, and can be detached easily from the soil body. They conglomerate into large lentils of similar shape, several feet in length and width. In soils with impeded drainage the lentils are feebly developed and hard, and break away into irregular or prismatic clods. In good permeable soils they are less hard and peel off into similar-shaped small lentils measuring $1 \times \frac{1}{4}$ inch.

The structure pattern consists of a set of parallel planes of cleavage inclined about 30° to the ground surface in the direction of the subsoil drainage. The lentil structure helps percolation, prevents run-off and controls erosion and the soils are highly productive. This may be due to the prevention of accumulation of alkaline salts and free upward movement of soil solution towards the root

zone. The water table is considerably lower than in the black soils which do not have this structure.

[1463] 631.445.73
THORP, J.; BALDWIN, M. **Laterite in relation to soils of the tropics.** *Ann. Assoc. Amer. Geog.* 30, 1940 (163-194). [U.S.D.A.]

The development and distribution in the tropics of red and yellow podzolic soils and of reddish brown lateritic soils are described. The podzolic soils are easily eroded and truncated; the lateritic soils have excellent tilth, drain well, can be irrigated and heavily fertilized and do not erode badly. Lateritic soils are distinguished from Buchanan's laterite which occurs in the tropics in limited areas in association with as large a variety of the great soil groups as occurs in temperate regions. Buchanan's laterite is a soil horizon which, where undisturbed or un-eroded, lies well below the soil surface. This horizon is concretionary in character and may be illuvial. It is hydromorphic and represents a kind of Planosol development and is the end product of long weathering in warm climates under the influence of a periodically fluctuating water table. The land surface must have been a peneplain for a long time with no deposition of fresh material. Laterite has developed from a large variety of parent materials. Laterite horizons are most likely to form where there are fairly well defined wet and dry seasons, although some laterites may occur where the present rainfall is fairly evenly distributed throughout the year. In arid central India and in desert Australia laterite exists where geological evidence shows that the material is fossil and was formed in a previously much more humid environment.

Soils beneath the ploughed layer of paddy fields in the tropics and subtropics are gradually trending towards the Planosols and finally towards ground-water or Buchanan's laterite.

The general characteristics of tropical soils and their environments and use are discussed.

631.452.3 FERTILITY. TOXICITY
[1464] 631.452:33
ORR, J. B. **Soil fertility—the wasting basis of human society.** *Univ. London Sanderson-Wells Lecture* 1948, pp.19.

The present rapid increase in populations, due largely to preventive medicine which is still in its infancy, may raise the population of the world by 500 million "within the lifetime of our children". These millions are likely to demand more and better food than their parents got. An international commission has reported that to meet the increasing demands for food, food production will need to be doubled in the next 25 years. The task of achieving this increased production has been made more difficult by the widespread loss of soil and soil fertility that has occurred in modern times. The division of the world into two opposing ideological camps has lessened the chances of getting any effective international action to increase the productivity of the land. In 1946 the Director General of F.A.O. proposed the setting-up of a World Food Board with wide powers to promote a rapid increase in food production, but owing to lack of enthusiasm in the U.S.A. and U.S.S.R. this was watered down to a World Food Council which had power to recommend action by governments, but no power to act itself. The Council is now functioning to the full capacity of the limited powers given to it. It is suggested that "the only hope of avoiding war is to get the two great modern powers to cooperate on something. Cooperation on a world food plan to which both can contribute so much offers the best chance of establishing contact and joint action."

[I465] 63I.453 : 546.77
BRECHLEY, W. E. **The toxic action of molybdenum in relation to soils and crops.** *Ann. Appl. Biol.* 35, 1948 (139-160). [Rothamsted]

Tomatoes grown in ordinary loam showed little outward sign of poisoning with heavy doses of sodium molybdate, but there was some depression of the crop when the dose was divided into early and late treatments. On some light soils and fen soils the plants were killed at an early stage with 4 gm. of sodium molybdate per 10 kg. of soil and seriously injured with 2 gm. The reaction of different crops varied in the same soil with similar treatments. On old cucumber soil tomatoes showed no sign of toxicity even with the heavy dressing of Mo, flax was progressively damaged with increasing doses and *Solanum nodiflorum* was most seriously

affected even with the lighter dressing of Mo. The composting of loam with peat usually reduced the toxicity of Mo.

63I.459 SOIL EROSION

(See also Abs. Nos. 1671, 1677, 1706, 1707, 1708)

[I466] 63I.459 : 34
LAWRENCE, A. O. **New soil conservation act in Victoria.** *Aust. Forestry* 11, 1947 (34-36).

In June 1947 the Victorian Parliament passed the Soil Conservation and Land Utilization Act 1947, setting up a Land Utilization Authority of three full-time members—a farmer, a forester and a water-supply engineer. The Authority is responsible to the Minister for Conservation and has power to demonstrate and conduct experiments in soil conservation, and to advise on land use. In certain circumstances a landholder may be required to use his land as directed by the Authority. Provision is made for a Land Utilization Advisory Council, consisting of the chairman of the Authority and the heads of the Departments of Agriculture, Forests, Lands and Water Supply, to advise the Authority on land-use policy in catchment areas.

[I467] 63I.459 : 551.55
BEADLE, N. C. W. **Studies in wind erosion. I. The origin, general appearance and classification of scalds.** *J. Soil Conserv. N.S.W.* 4, 1948 (30-35). [Univ. Sydney]

A scald, sometimes referred to as a "clay-pan", is a bare area produced by removal of the surface soil by wind. Conditions necessary for the initiation of a scald are absence of vegetation, e.g., as after heavy grazing and drought, susceptibility to drift and a sufficiently high proportion of clay in the subsoil to form a wind-resistant surface. Soft scalds are derived from soils comprising sandy loam over clay. When free water evaporates from the scald surface a film of clay is deposited which cracks as the whole mass dries out, causing the soil to contract into nut-like aggregates. Such a scald can be ploughed to a depth of several inches. Hard scalds, which do not crack, may have

surfaces of compacted clays, difficult to disturb, or of sand particles cemented by clay. Limestone scalds develop where limestone nodules occur close to the surface as in some desert loams and solonized brown soils. After prolonged exposure a hard impervious surface crust is formed by redistribution of the limestone over the scald. Bare surfaces which develop by destruction of the superficial crumb aggregates by loss of organic matter, raindrop action and padding of stock are called pseudo-scalds.

[1468] 631.459 : 551.55
BEADLE, N. C. W. **Studies in wind erosion. II. Some characteristics of scalded surfaces.** *J. Soil Conserv. Serv. N.S.W.* 4, 1948 (64-68). [Univ. Sydney]

Factors retarding regeneration of scalded surfaces are discussed. High maximum temperatures, which may exceed shade air temperatures by 20°F. in winter and 45°F. in summer, are recorded on scalded surfaces and are mainly due to lack of protective vegetation, to the red-brown colour of the surface and relatively calm days. Such temperatures, which may exceed 140°F. for 6-7 hours of the day, cause the death of many plants and result in a high rate of evaporation. The heated surfaces also cause an upward movement of hot air and the development of local dust storms in which flying sand grains may cut to pieces soft leaf tissues; this effect is not confined to the scald itself, but extends to adjacent non-eroded country. Low porosity results in a low rate of water infiltration particularly into compacted clay. Ploughing increases the infiltration rate but the effect is only temporary. Seed deficiency is another important factor retarding colonization.

[1469] 631.459 : 551.55
BLANDFORD, C. M. **Some further remarks on dust storms.** *J. Soil Conserv. Serv. N.S.W.* 4, 1948 (36-39).

Lack of rainfall, absence of vegetation and reserves of dust are necessary conditions for dust storms which may be of minor or major types. In the former, which is of short duration, the wind has a high velocity near the ground and is very turbulent and the transported dust does not reach high altitudes, but in major storms the transporting wind is a general movement of the air mass

and the dust reaches altitudes which may be as much as 10,000 ft. Sand grains rarely rise higher than about 39 inches and may be bounced along (saltation) but clay particles are lifted very much higher. As the velocity of the wind diminishes so does the size of the carried particles. Deposition rates of 963½ lb./acre of dust have been recorded. Vegetative cover prevents wind access to dust reserves and windbreaks reduce wind velocities but the establishment of vegetation in low-rainfall areas is difficult. Regulation of grazing to preserve the densest natural vegetation possible is important.

[1470] 631.459 : 551.55
TAYLOR, T. P. **Wind erosion in the Harden district.** *J. Soil Conserv. Serv.* 4, 1948 (69-73).

General features of wind erosion, and the effects of some particularly severe dust storms in February, 1947, in New South Wales are described. Preventive measures are mentioned.

[1471] 631.459 : 551.55 : 631.61
SIMS, H. J. **Wind erosion control. Comments on methods used in the Walpeup District.** *J. Dept. Agric. Victoria* 46, 1948 (241-248).

Fallowed areas were responsible for most of the soil drift. Control methods used were the non-burning of stubbles, the use of cover crops, the sowing of ryecorn on hills, channels and other vulnerable points, adjusting cultivation according to soil types and crop rotation.

[1472] 631.459 : 551.55 : 634.953.6
DZETOVETSKY, V. V. **[Wind erosion, its prevention and control].** *Pochvovedenie* 1948 (121-126). [R.]

A system of tall windbreaks without bushes to prevent the accumulation of dead air at low wind speeds is suggested. Supplementary windbreaks situated in the fields themselves but with 50-60 m. gaps to allow for the passage of farm implements are part of the scheme, which is based on a series of calculations of windspeeds and height and density of the windbreaks.

[1473] 631.459 : 581.5
MINSHALL, N. E. **Effect of conservation practices on runoff.** *Agric. Engng.* 29, 1948 (201-202).

On one small agricultural catchment of loess above glacial till, with a claypan at 10-20 inches there was a good relationship between total runoff and precipitation for the 12-month periods beginning on the 1st of January, July or October. Rainfall-runoff curves, drawn from all the 12-month averages show least total runoff from lucerne, followed by terraced-cultivated land, pasture (severely eroded on steeper slopes) and cultivated areas. In view of variations in the sizes, shapes and topography of the catchments and the local differences of rainfall intensity, the peak rates of runoff were not investigated; it was considered that retention during storms gave the best comparison of the effects of different covers. For 6 of 10 heavier storms the pasture retained more water than the cultivated areas, but land under lucerne retained more than pasture land for 2 of the storms. First-year lucerne retained less than pasture.

On another catchment of soils of at least 4 feet of loess above limestone, there was no relationship between annual precipitation and runoff. Runoff records for 2 storms of equal intensity and similar antecedent rainfall conditions show that, for such pervious soils, both the type and the degree of development of the cover markedly affect peak rates.

[1474] 631.459 : 625.7/8
FRASER, H. A. **Soil conservation near Holbrook.** *J. Soil Conserv. Serv. N.S.W.* 4, 1948 (4-9).

A description is given of conservation measures undertaken in a 2000-acre catchment, consisting of grazing lands and a limited area of arable land, in connexion with the siltation and flooding of an important main road. These measures comprised pasture furrowing, topdressing of the grazing lands with super. and dam construction.

[1475] 631.459 : 631.58
BAIRD, R. W. **Runoff and soil conservation practices.** *Agric. Engng.* 29, 1948 (216-217).

The Blacklands experimental watershed in Texas comprises 2 similar 300-acre heavy-clay watersheds which from 1937 until autumn 1942 were under ordinary farming practices with 0-10% under grass and the rest under cotton (about 50%), maize, oats, etc., with straight-row cultivation. In 1942 on one watershed the cotton was reduced and

the grassland increased and sloping cultivated land was terraced, resulting in a decrease in peak rates of run-off of up to about 16%, the effect being slightly less for larger floods. In long rainy periods, run-off rates may almost equal rainfall rates on these soils and only practices reducing the velocity of flow or increasing temporary storage, for example in terrace channels, will affect the rate.

The effect of improved practices on amounts of run-off is not yet clear, but there seems to be slightly less run-off from soil which is dry at the start of a storm. Sown grass may require time for its effects to show fully.

The ratio of the soil losses from two 20 acre areas under ordinary practice was 1.2 : 1. On establishing improved practices on the first area the ratio became 0.09 : 1.

[1476] 631.459 : 633.2
COX, M. B.; PALMER, V. J. **Results of tests on vegetated waterways and method of field application.** *Okla. Agric. Expt. Sta. Misc. Pub.* MP-12, 1948, pp. 43.

Results of investigations on protection of waterways from erosion indicate that short Bermuda grass is superior to other covers, while lucerne and weeping love-grass were least effective. Buffalo and blue grama grasses gave better channel protection than long Bermuda grass under light-to-moderate velocity tests, but were unable to withstand high-velocity flows as well as Bermuda grass.

[1477] 631.459 : 634.9
GORRIE, R. M. **Farm forestry in the Punjab.** *Indian Forester* 73, 1947 (435-437).

Farm forestry, particularly shelter belts to stop sand drifting, is advocated as a soil-conservation measure, but it is beyond the scope of the individual farmer in the Punjab, and is essentially a matter of land planning by catchments. This is being done where soil-conservation districts exist, but for complete success some kind of land-utilization board with powers to coerce unwilling participants is required.

631.46 SOIL MICROBIOLOGY

(See also Abs. Nos. 1422, 1441, 1555, 1580, 1581, 1582, 1624, 1633)

[1478] 631.461 : 632.951
WILSON, J. K.; CHOUDHRI, R. S. **The effect of benzene hexachloride on soil organisms.** *J. Agric. Res.* 77, 1948 (25-32). [Cornell Agric. Expt. Sta.]

The production of NH_3 in 100 gm. of soil to which casein, peptone, urea or dried blood had been added was practically unaffected by the application of 0.15 gm. of 20% crude benzene hexachloride. Bacterial and fungal counts were also unaffected, and this non-toxic action was confirmed by an investigation of treated field soil under potatoes. The insecticide was injurious at a rate of 4 lb./acre to *Azotobacter* and at 30 p.p.m. to red clover, soybean, lucerne and hairy vetch although the nodule bacteria tolerated heavier applications than did the plants. Growth of pure cultures of nodule bacteria, *Aspergillus niger*, *A. oryzae*, *Penicillium expansum* and *P. italicum* on slopes treated with benzene hexachloride was retarded for the first 24 hours, but afterwards was equal to or better than that of the controls. Algal growth was suppressed. Experiments with pure isomers showed that the toxic effects can be attributed to the γ or δ isomer or to heptachlorocyclohexane.

[1479] 631.461 : 632.951
POCHON, J.; LAJUDIE, J. Action de certains antiseptiques sur la microflore normale du sol. [Effect of some antiseptics on the normal microflora of the soil.] C.R. 226, 1948 (2091-2092). [F.]

The effect on various micro-organisms of applying hexachlorobenzene, a mixture of dichloropropane and dichloropropylene, and ethylene dibromide at the concentrations usually used to agricultural and market-garden soils was studied. *Cytophaga*, Actinomycetes and nitrifying and ammonifying bacteria were almost unaffected while nitrite-forming organisms and *Azotobacter* were slightly stimulated. Effects were manifest in 8 to 15 days, showed no preliminary phase of inhibition and remained constant for at least two months.

[1480] 631.461.3
CHASE, F. E. A preliminary report on the use of the Lees and Quastel soil perfusion technique in determining the nitrifying capacity of field soils. Sci. Agric. 28, 1948 (315-320).

The soil perfusion apparatus used in these studies is described. Preliminary results on the possible usefulness of the technique as an indicator of the nitrifying capacity of soils show 4 distinct curves from the first 4

soils studied. Such curves give information concerning the lag period, the maximum velocity and the amount of ammonia-N the micro-organisms can nitrify in a given soil before some limiting factor brings the process to a halt. The addition of a mulch of legume hay to a sandy loam soil stabilized the population of nitrifying organisms at its maximum level.

[1481] 631.461.51 : 631.416.7
GAINES, P. L. The significance of available calcium as a factor limiting growth of *Azotobacter* at pH levels below 6. J. Agric. Res. 76, 1948 (265-270). [Kansas Agric. Expt. Res.]

A modification of Ashby's medium was buffered at pH values of 5.85, 6.00, 6.20, 6.40 and 6.60, and to one series a Ca-saturated clay suspension was added. In both series growth of *Azotobacter* did not occur at pH values below 5.9, but was good below pH 6.4; the fact that addition of the Ca clay did not make growth possible at the lower pH values suggests that lack of available Ca was not responsible for the failure of *Azotobacter* to grow below pH 5.9.

[1482] 631.461.52
HEDLIN, R. A.; NEWTON, J. D. Some factors influencing the growth and survival of rhizobia in humus and soil cultures. Canad. J. Res. 26c, 1948 (174-187). [Univ. Alberta]

Sterile and unsterile samples of black-zone loam and high-lime peat alone, mixed with loam or with C black were inoculated with *Rhizobium trifolii* and *R. leguminosarum*. Plate counts were made at 10, 40, 70 and 140 days during storage at room temperature and under various conditions of aeration and nutrition. After an initial rise the numbers of rhizobia dropped sharply to zero in the sealed flasks, particularly in the peat and peat mixtures, whereas in cotton-stoppered flasks the counts remained at a fairly high level on the sterile bases, but fell to zero at 148 days in the unsterile flasks. Addition of nutrients increased the numbers of nodule bacteria except in the final count of the peat and peat-black soil mixture and in the unsterile peat-C mixture. Numbers were higher in Erlenmeyer flasks than in paper cartons.

[1483] 631.461.52:581.144.2
NUTMAN, P. S. **Physiological studies on nodule formation. I. The relation between nodulation and lateral root formation in red clover.** *Ann. Bot.* 12, 1948 (81-96). [Rothamsted]

Plants of red clover were grown on agar slopes under sterile conditions and inoculated at 6 weeks with effective and ineffective strains of nodule bacteria. Results of root and nodule counts suggest that the possible foci of infection are the actual initials from which the lateral roots arise, the sum total of roots and nodules being almost constant whether the plants were inoculated with effective or ineffective strains. The simultaneous appearance of nodules and lateral roots in inoculated plants may be accounted for by postulating a further restriction of infection to those foci which arise in the zones of the root on which growing root hairs are to be found.

[1484] 631.461.74:576.809.7:631.461.51/2
VIRTANEN, A. I.; LINKOLA, H. **On the antibacterial effect of spore-forming bacteria on the legume bacteria.** *Suomen Kemis.* B21, 1948 (12-13). [E.]

An organism of *Bacillus-mesentericus* type was isolated from low-moor peat and leaf mould that inhibited the growth of *Rhizobium*, *Azotobacter* and *Sarcina flava*. The spores of the bacillus are highly thermo-resistant and difficult to destroy by autoclaving, particularly when porous soils rich in organic matter are concerned.

[1485] 631.466.1
HARLEY, J. L. **Mycorrhiza and soil ecology.** *Biol. Rev.* 23, 1948 (127-158).

The subject is reviewed under the headings: spatial distribution of micro-organisms in soil; interrelationship of roots and micro-organisms; the place of mycorrhizal fungi in the rhizosphere; conditions for mycorrhiza formation; influence of micro-organisms of the root region on the activities of the host plant; survey of hypotheses advanced to explain mycorrhizal phenomena. Over 120 references are given.

[1486] 631.466.1:631.42
LA TOUCHE, C. J. **Slide-traps for soil fungi.** *Trans. Brit. Mycol. Soc.* 31, 1948 (281-284). [Mushroom Res. Ass. Yaxley, Hunts.]

A trap for collecting actively growing soil fungi as distinct from accidental, inactive organisms, consists of two hanging-drop slides clipped together with a suitable agar medium enclosed between their opposing concavities. The whole is embedded in the soil until the agar is invaded by mycelia. The agar is then transferred in a sterile manner to a medium such as 3% malt-extract agar in a Petri dish.

[1487] 631.466.1:631.461.61
GOŁĘBIEWSKA, J. **Przyczynek do badań nad rozkładem błonnika przez grzyby niższe występujące w glebie. [Contribution to the study of cellulose decomposition by soil moulds.]** *Ann. Univ. Mariae Curie-Skłodowska* 2E, 1947 (223-248). [Pl.e.]

The following soil fungi have been isolated from acid soil and recognized: *Chaetomium finestre*, *C. indicum*, *C. kunzeanum*, *C. spirale*, *Penicillium*, *Mycogone puccinoides*, *Dicocceum asperum* and *Trichoderma lignorum*. *C. indicum* and *C. spirale* were the most active species in cellulose decomposition. Other *Chaetomium* spp. and *Trichoderma* were less energetic and decomposed 30-60% of cellulose. All the fungi, except *Mycogone* required mineral N for their cellulolytic action, but *Mycogone* could break down cellulose energetically only in the presence of organic N.

[1488] 631.466.3:576.809.7
FLINT, L. H. **Antibiotic activity in the genus Haplosiphon.** *Proc. La. Acad. Sci.* 10, 1947 (30-31). *Biol. Abs.* 22 (389). [La. St. Univ., Baton Rouge]

An exudate of *Haplosiphon* sp. possesses antibiotic properties and is capable of lysing other soil algae. The exudate is lethal to *Utricularia* spp., alligator weed, rye grass and rye.

631.47 SURVEYS

[1489] 631.471
RODE, A. A. [The "world soil map" of academician L. I. Prasolov.] *Pedology* 1947 (450-451). [R.]

This map, published on a scale of 1:50,000,000 in the Great Soviet Atlas in 1937, is claimed to be the first of its kind to be based mainly on factual material about soils and not on the interpretation of botanical geological, etc., data.

[1490] 631.471
HARRISON, R. **Farm surveying: a diagnosis and treatment.** *Farming* 2, 1948 (110-116).

The principal object of a farm survey should be to discover those factors which are adversely affecting soil conditions, plant growth and the economical management of the estate. A simple technique for surveying the topography, drainage, vegetation and soil conditions on a specimen farm is described with maps and with suggestions for improvements.

631.48 SOIL FORMATION (See also Abs. No. 1657)

[1491] 631.48
POLYNOV, B. B. [Leading ideas of the contemporary study of soil formation and development.] *Pochvovedenie* 1948 (3-13). [R.]

Soil is regarded as the product of the interaction of living organisms with mineral rock. Most of the chemical elements are constituents of one or other form of organism, the main elements in living matter being, with the exception of C, also the main elements comprising the country rocks. In the continuous cycle of elements through organisms and back to the soil some elements are held back more than others so that the relative proportions of the elements in the soil gradually change as a result of the action of organisms as well as of the differential removal or accumulation by leaching of the elements of the original rock. Thus, whereas according to physico-chemical theory the relative migration of the elements K, Na, Ca and Mg in the earth's crust should be in the above order, it is in fact, over large parts of the earth's surface, in the order Ca, Na, Mg, K. The difference in these orders is caused partly by the nature of soil colloids and partly by biological forces which prevent the complete removal from the soil of those elements which are contained in the organisms inhabiting the soil.

It is possible to explain many of the characteristics of soil types in terms of either geomorphology (e.g. catena relationships) or plant-soil relationships or, more generally, of both. It is shown that the relative mobility of Ca and Si in soils of the chernozem

zone is connected with the high content of these elements in the natural vegetation. Again, the absence of podzolization and the richness of the soils in sesquioxides in the humid sub-tropical red-earth zone are related to the ready absorption of Fe and Al by sub-tropical plants and the almost unbroken growing period which keeps the sesquioxides in continuous circulation.

[1492] 631.48 : 631.415.3
BIRUKOVA, A. P. [Formation of horizons of accumulation of gypsum in the soil.] *Pochvovedenie* 1947 (669-674). [R.]

The formation of gypsum horizons was studied in both laboratory and field experiments and it appears probable that the gypsum is transported from the ground water by capillaries and deposited on the upper limit of capillary moisture, which is at a depth of 60 cm. in solonchaks soils and at 110-120 cm. in southern chernozem soils. It has been shown that the deposition of gypsum cannot occur as a result of an exchange reaction between the Ca of the absorbing complex and the Na sulphate in the ground water.

[1493] 631.48 : 631.415.3
KOVDA, V. A. [Processes of contemporary salt accumulation (halogenesis) in soils and waters.] *Pochvovedenie* 1947 (675-679). [R.]

The mechanism and chemistry of the processes of salt accumulation differ in ground waters, in soil solutions and in soils. In ground waters salt accumulation depends on the intensity of evaporation of the ground waters. In soils salt accumulation resembles that in ground waters with the difference that the soil temperature being higher than that of ground water the solubility of sulphates is increased. Therefore soil solutions contain more sulphate than the original ground water although the concentration was the same initially.

[1494] 631.482 : 631.435
KHARITONOV, G. A. [The physical characteristics of suspended alluvia.] *Pochvovedenie* 1947 (497-499). [R.]

A comparison of aggregate and ordinary mechanical analyses of fresh river alluvium and suspended matter in field run-off showed that up to 80% of the clay (<0.001 mm.) may occur as aggregates in the finer sand and silt fractions.

631.5 CULTURAL OPERATIONS

(See also Abs. Nos. 1405, 1641)

[1495] 631.51 : 631.432.2
 DUMO, V. I. [The effect of disc cultivation on the physical properties of a podzol soil when bringing new land into cultivation.] *Pochvovedenie* 1947 (741-745). [R.]

This form of cultivation has a favourable effect on newly cultivated land as it creates a uniform cultivated layer, although it decreases permeability and lowers the percentage of absolute moisture. It should not however, be used on a field already under cultivation as it then has a definitely harmful effect on soil moisture.

[1496] 631.585
 DULEY, F. L.; RUSSEL, J. C. Stubble-mulch farming to hold soil and water. *U.S.D.A. Farm. Bull.* 1997, 1948, pp. 32.

A system of farming is described in which the residues of the crops grown on the land are used as a mulch to conserve soil and water. Since the residue includes the stubble plus other parts of the crop, this kind of farming has come to be called stubble-mulch farming. Instead of removing destroying or ploughing-under the residue it is left on the surface of the soil. Thus the fields have a year-round cover. Used in this way the residue, or stubble, greatly reduces erosion by both water and wind. The stubble mulch prevents wind from blowing and rainfall from compacting, the soil. It improves the soil structure, so that the soil can absorb and hold more water. All tillage—called sub-tillage—is done below the surface in order to have the dead residue on the top.

New implements and new methods of tillage needed for this system of farming are fully described. Implements called "sub-surface tillers" or "sub-tillers" have been devised for running under the surface at a depth of 2-6 inches to loosen the soil without turning it over. These implements are of three principal types: (1) tillers with V-shaped sweeps, (2) straight-blade tillers and (3) rod-weeder tillers. On sub-surface tilled land all supplementary, smoothing operations can be accomplished with a single implement called a "treader", which is made by reversing the pronged wheels on a certain type of rotary hoe. The treader can be used to pack the soil, to pulverize it and to kill weeds.

Stubble-mulch farming has also proved highly profitable in low rainfall areas in dry years, showing a 60% increase in crop production of maize, for a period of three dry years, over that obtained with the usual method of ploughing-under all crop residues.

[1497] 631.589 : 631.436
 MASSON, H. La température du sol au cour d'un feu de brousse au Sénégal. [Soil temperatures during a scrub fire in Senegal.] *Agron. Trop.* 3, 1948 (174-179). [F.]

A fire lasting for 70 seconds in sparse herbage on stony ground with a strong wind blowing produced a temperature of 109° a few mm. above the soil surface after 8 minutes. Without a wind the temperature after 1 minute was 29°C., and after 9 minutes 213°C. In experiments with a scrub fire the temperature, starting at 65°C. before the fire, rose to 715°C. in 75 seconds. In a sandy soil the temperature was not affected at a depth of 4 to 5 cm., but at 2 cm. a rise of 14.4° occurred in 7 minutes, when the surface had cooled to 150° after reaching a peak of 720° in 3 minutes.

631.61 LAND RECLAMATION

(See also Abs. Nos. 1507, 1537, 1563)

[1498] 631.61 : 633.61 : 633.18
 MACGREGOR, N. M.; DUTTA, S. K. The utilisation of waste land. Timber, grazing, sugarcane and rice. *Indian Tea Assoc. Memo.* 20, 1947, pp. 19.

In order to utilize the waste lands which adjoin tea gardens their afforestation or utilization as grazing lands or for sugar cane or rice is discussed, together with suitable methods of cultivation and manuring.

Sugar cane cannot be grown except on virgin jungle soil unless it is very heavily manured, and as much as 150-250 lb. N/acre may be needed.

Double cropping of rice land is necessary to make the most of the soil as there is ample time and moisture for two crops to be cultivated. One of the reasons why double cropping is not usually practised is that if the *aus* crop is late owing to late spring rains it holds up the following *sali* crop of rice which is considered to be the more important

one. Rice land is not usually manured, but if two crops are to be grown it is necessary to manure the land for the *sali* crop. Cattle manure should be applied to the land in the spring after the second ploughing at a rate of 150-200 maunds/acre. When preparation of the land has been completed 4 maunds of oil cake/acre is desirable.

[1499] 631.611
STAPLEDON, R. G. **The pre-treatment of permanent grass.** *Farming* 2, 1948 (133-136).

Poor pastures should be pre-treated on a generous scale in order to improve the sward so that the acreage of permanent grass may be decreased by a half and that of ley farming increased. Old meadows usually full of Yorkshire Fog and weeds, overgrazed pastures full of weeds with restricted root systems, fields dominated by buttercups, ill drained, undergrazed fields full of rushes, neglected fields with densely matted sod can be improved by pretreatment with dressings of lime which help to rot the mat. The lime should be brought into contact with the underlying sod by heavy dragging. This should be followed by applications of N, P and K and the scattering of 2 lb./acre of white clover in spring.

[1500] 631.612
FENLEY, J. M. **Sand dune control in Les Landes, France.** *J. Forestry* 46, 1948 (514-520).

Passing inland from the coast, the successive zones of the Landes are (1) the littoral dune, composed of the seaward-sloping white dune and the less sparsely vegetated grey dune on the inland slope, (2) the littoral zone, about 2½ miles wide, in which disturbance of the unstable soil is prevented by the planting of maritime pine with an undergrowth of *Ulex europaeus* and *Sarothamnus scoparius*, and in which no commercial timber production is allowed, and (3) the commercial zone under maritime pine.

The chief control measures are applied in the littoral dune, and consist in building it to a height of 50 metres by erecting wind-break walls or "cordons", originally of wooden slabs vertically driven in, but today of brushwood, from the littoral zone, woven between stakes 2 feet apart. As the cordons become buried, new ones are constructed,

and when the predetermined height is reached the dune surface is stabilized at that height by naturally-spreading or planted *Ammophila arenaria*.

[1501] 631.612
SALE, G. N. **Note on sand dune fixation in Palestine.** *Emp. Forestry Rev.* 27, 1948 (60-61).

Moving dunes on the sandy coastal strip of Palestine south of Acre, where rainfall is 372-616 mm. and winds are strong, are being afforested with *Acacia*. Seedlings established in the dunes where water is available in wells are planted as soon as practicable into pots filled with a mixture of soil, sand and manure. At a year old, the seedlings are planted at the bottom of pits 3 feet deep which are then filled with sand so that only the top twigs of the plants are to be seen. The original roots are thus in a sand layer which is always cool and moist. To reduce blowing of sand, branches from old plantations are strewn over the area and butts of branches are sometimes buried. Cuttings of tamarisk are planted as windbreaks. In some areas soil movements are checked within 3 years of planting bushy *Acacias*. A ground cover of grasses, *Artemisia* and other low shrubs follows and lupins are sometimes sown to enrich the ground cover. A forest soil is developing and the land may be used later for vineyards and other crops.

[1502] 631.612 : 633.285
BROWN, R. L.; HAFENRICHTER, A. L. **Factors influencing the production and use of beachgrass and dunegrass clones for erosion control. I. Effect of date of planting.** *J. Amer. Soc. Agron.* 40, 1948 (512-521). [U.S. S.C.S.]

The survival of transplanted clones of European beachgrass on coastal dunes was determined by maximum temperature and not by precipitation. Survival was 50% or more when maximum temperatures did not exceed 55°F., and 80% or more when maximum temperatures were 51° or less. The season of planting can be longer with American beachgrass which is less sensitive to environment.

[1503] 631.613
GORRIE, R. M. **Contouring in principle and practice.** *Indian Forester* 73, 1947 (391-398).

[1504] 631.615
WILLIAMS, O. G. **British grassland.—Present problems. East Midlands.** *J. Brit. Grassland Soc.* 3, 1948 (161-163).

In 30,000 acres of land that have been worked for surface coal to a depth of 60-200 feet, the top soil which had been put on one side has been replaced giving a covering of 4-6 inches. The soil is almost sterile clay and even with heavy manuring the grasses turn yellow by the second year, and Italian ryegrass is replaced by inferior types in the third and fourth years. Reclamation may take 5 years as extensive subsidence takes place and drainage should be left until the land has settled down.

In areas of ironstone workings, soils range from light estuarine sand to heavy boulder clay. The top soil is not replaced as in open-cast coal workings. Applications of K and P have resulted in quick establishment of leguminous plants which are followed slowly by grasses. Ryegrass is almost useless, but cocksfoot, timothy and meadow fescue are fairly persistent.

An open-cast gypsum site has been left for 10-15 years and then cropped with lucerne followed by a cereal.

In fenland, the pH may be only 4.5, and applications of 10 tons/acre of ground limestone have not corrected acidity. Even if the take of grass seeds is satisfactory soft fog (*Holcus mollis*) often squeezes out the sown grass. It is hoped that thorough cultivation and the sowing of mixtures containing white clover will smother out the fog before it establishes itself.

631.8 FERTILIZERS (See also Abs. No. 1691)

[1505] 631.81
SCHARRER, D. K. **Nature and problems of fertilizing in modern times.** *Amer. Fert.* 108, 1948, No. 10 (7-9, 24-28). No. 11 (7-10, 26-27). No. 12 (10-11, 22-25). [Inst. Agric. Chem., Univ. Giessen, Germany]

An historical outline of problems of fertilizing translated from *Chemiker-Zeitung*, Vol. 68, No. 5, 1944 (75-93).

[1506] 631.81 : 551.481
EDMONDSON, W. T.; EDMONDSON, Y. H. **Measurements of production in fertilized salt water.** *J. Marine Res. (Sears Foundation)* 6, 1947 (228-246). C.A. 42 (4694).

The rate of oxygen production was increased by factors of 1.5-5 by fertilizing sea water with phosphate and nitrate. There was a close correlation between rate of utilization of phosphate and oxygen production.

[1507] 631.81 : 631.67
PEIKERT, F. W.; COOK, R. L. **Applying fertilizer through irrigation water.** *Mich. Agric. Expt. Sta. Quart. Bull.* 30, 1948 (437-444).

N and K can be supplied satisfactorily through irrigation water. P is not adapted for this practice. Experiments have shown that the most efficient method of applying P is in bands rather than broadcast. The greater efficiency when applied in bands is largely due to the lesser contact between the fertilizer and the soil and less chance of fixation. It is suggested that a little N, all the P and a little K be applied in bands at planting time and supplementary N and K be applied through irrigation water when tests indicate that they are needed.

631.811 PLANT NUTRITION (See also Abs. Nos. 1434, 1586)

[1508] 631.811 : 631.417
DUDA, J. Wpływ niektórych związków koloidowych na pobieranie azotanu amonu (NH_4NO_3) i fosforanu amonu ($(\text{NH}_4)_2\text{HPO}_4$) przez korzenie roślin. [Influence of some colloidal compounds on ammonium-nitrate and ammonium-phosphate intake by plant roots.] *Acta. Soc. Bot. Polon.* 18, 1947 (179-208). [Pl.e.] [Univ. Poznań.]

Solution-culture experiments were made with 0.02 N NH_4NO_3 and 0.01 N $(\text{NH}_4)_2\text{HPO}_4$ as sole sources of the respective ions in Pfeffer's nutrient solution, to which was added solutions of purified humus, agar-agar, starch, silica sol and iron-hydroxide sol each at three levels and control. Most experiments were made with hemp (*Cannabis sativa*), but three experiments were made with lettuce (*Lactuca sativa*); flax (*Linum usitatissimum*) and *Cucurbita pepo* were also used once. All pots were in triplicate, and good agreement was obtained. Data include weight of dry root, weights of NH_4 , NO_3 and HPO_4 ions absorbed, and pH. In every instance the addition of the colloid markedly

increased uptake of both NH_4 and NO_3 from NH_4NO_3 and of NH_4 and HPO_4 from the phosphate; the ratios of equivalents of NH_4 to NO_3 or HPO_4 were not significantly affected and throughout were roughly constant at about 1.3:1 and 3.8:1 respectively. Weight of dry root appeared to be unaffected by addition of colloid.

Absolute uptake of NH_4 from either ammonium salt per 100 mg. of root dry-matter varied with the plant, and was least with lettuce. Hemp appeared to take up at least as much NH_4 (per gm. of dry root) from the nitrate as from the phosphate, in spite of the additional uptake of $\text{NO}_3\text{-N}$; lettuce, however, took up less NH_4 from the nitrate than from the phosphate, though it absorbed a greater total of N from the nitrate. Hemp made only slightly more root with ammonium nitrate than with phosphate, but lettuce produced 50% more root with the nitrate. These conclusions were substantially independent of the nature or amount of colloid added.

At present no explanation can be offered for the effects of the colloids in increasing growth. An organic growth-substance effect is dismissed since the colloids were either purely inorganic or were specially purified: a specific effect of colloids external to the root is therefore invoked. Starch and agar (hydrophilic) colloids are claimed to have had a greater effect on ion uptake than the two inorganic (hydrophobic) colloids.—R.N.

[1509] 631.811:631.417
GROSSBERG, J. Wpływ drobnych ilości próchnicy na plon niektórych roślin i pobieranie składników pokarmowych przez nie. [Effects of small quantities of organic matter on the yields of some plants and on their uptake of some nutrient elements.] *Rocz. Nauk Roln.* 50, 1948 (31-50). [Pl.e.] [Inst. Pedol., Univ. Poznań.]

Pot trials with wheat, barley, oats, beans, peas and vetches grown in a mixture of equal parts of sandy loam and sand to which were added a basal dressing of NPK and the equivalent of 50 or 100 mg. of farmyard-manure carbon as water extract (neutralized and not) and the ash of farmyard manure; some treatments also included CaCO_3 . Yields of grain, straw and roots were recorded. In another set of trials with basal dressings of PK, NK, NP and NPK small doses of

peat extract or farmyard-manure extract were added. In these last experiments the effects of the inorganic N fertilizers were much greater than any effects from the organic extracts or their ash; and in general the effects of extracts or ash of manure or peat were slight. The mineral matter of manure given as ash promoted growth better than did an extract of the corresponding amount of manure.—R.N.

[1510] 631.811:631.417
NIKLEWSKI, B.; WOJCIECHOWSKI, J.; KEMPIANKA, W. Wartość produkcyjna rozpuszczalnej próchnicy kompostu. [The value of soluble humus of compost for plant growth.] *Rocz. Nauk Roln.* 50, 1948 (251-270). [Pl.e.] [Univ. Poznań]

Decomposition of compost made from dry leaves, rye chaff, peat and hotbed soil was favoured by addition of 1.25 gm. of ammonium sulphate to 1450 gm. of compost. Without such addition the compost contained 0.4%, with the nitrogenous addition 0.6%, and with a further addition of Na_2CO_3 1.2%, of water-soluble humus.

Greenhouse experiments were made with cucumbers in pots of sandy soil receiving basal dressings of constant amounts of N, P and K, to which were added compost or compost ash at various rates. Compost without inorganic NPK, compost ash in presence of NPK, and NPK alone produced little growth. Pots to which 3.42 gm. of the various composts (corresponding to 20-200 mg. of soluble humus) was added, produced much better growth than did any of the inorganic treatments. It is concluded that plant production increased approximately in proportion to the amount of soluble humus applied. This response of the plants to soluble humus was evident within 3 weeks from sowing.—R.N.

[1511] 631.811.2:539.16
MACKENZIE, A. J.; DEAN, L. A. Procedure for measurement of P^{31} and P^{32} in plant material. *Anal. Chem.* 20, 1948 (559-560). [Bur. Pl. Indust., Beltsville, Md.]

The method has been successfully used in greenhouse and field experiments to study the utilization of P from fertilizers labelled with P^{32} . The plant material is digested with nitric and perchloric acid, and, after filtering-off the silica, the P is precipitated as

ammonium phosphomolybdate and reprecipitated as magnesium ammonium phosphate which is collected as a thin uniform layer on a filter ring under standardized conditions, dried with alcohol and ether and stored in a desiccator at 50% relative humidity for 12 hours before weighing. The weight of the precipitate and the radioactivity measurement allow determination of the specific activity $P^{32}/(P^{31}+P^{32})$ of the plant material.

[1512] 631.811.2:539.16
SPINKS, J. W. T.; DION, H. G.; READE, M. ET AL. **Study of fertilizer uptake using radio-phosphorus. III.** *Sci. Agric.* 28, 1948 (309-314). [Univ. Saskatchewan, Saskatoon]

P^{32} was used to measure the uptake of fertilizer P and soil P by wheat plants grown in a greenhouse and fertilized at rates of 25, 75 and 225 lb./acre of $NH_4H_2PO_4$. With increased rates of P application the amount of total P and of fertilizer P taken up by the plant increased, but the percentage of applied P utilized by the plant decreased. The uptake of soil P was depressed by the application of P fertilizer, the amount of the depression being a function of the amount of P applied.

[1513] 631.811.3:582
LEWIS, C. C.; EISENMENGER, W. S. **Relationship of plant development to the capacity to utilize potassium in orthoclase feldspar.** *Soil. Sci.* 65, 1948 (495-500). [Mass. Agric. Expt. Sta.]

22 plants representing various degrees of development from the Ranunculaceae to the Compositae were grown in pots containing soil which had received no K for 55 years. KCl at a rate of 287 lb./acre was added to one series and equivalent amounts of orthoclase feldspar to another series. Analysis of samples at maturity showed that, in general, plants in the lower stages of evolution utilized more K from both sources than did those in the higher stages. The control plants of the lower orders showed K-deficiency symptoms earlier than those of the higher orders. This capacity of lower plants to utilize the K of relatively insoluble minerals is probably related to the relatively unweathered state of the soils in the earlier period of the earth's history.

[1514] 631.811.4:546.27
BRENNAN, E. G.; SHIVE, J. W. **Effect of calcium and boron nutrition of the tomato on the relation between these elements in the tissues.** *Soil Sci.* 66, 1948 (65-75). [N.J. Agric. Expt. Sta.]

Tomatoes were grown in sand culture supplied with 5, 50, 100, 250 and 500 p.p.m. of Ca and with 0.001, 0.10, 0.25 and 5.0 p.p.m. of B at each level of Ca. All plants grown at 0.001 p.p.m. of B exhibited B-deficiency symptoms which were most marked in plants receiving a high Ca concentration. Solutions containing 5 p.p.m. of Ca and 0.10 or 0.25 p.p.m. of B induced Ca-deficiency symptoms. The amount of B in the various parts of the plant increased with increasing concentrations of B in the solution, but was reduced as the Ca level was raised. The Ca content of the plants was also related to that of the nutrient solution, but was unaffected by changes of B level. The Ca:B ratios of the leaf tissues of B-deficient plants ranged from 1000 to 2380 and those of B-toxic plants from 30 to 114; it is suggested that the Ca:B ratio of the plant may serve to indicate the status, with respect to the availability of these elements, of the soil in which the plant was grown.

[1515] 631.811.9
HARVEY, D. G. **Trace elements in plant and animal nutrition.** *Vet. J.* 103, 1947 (278-289). *Herb. Abs.* 18 (162). [Roy. Vet. Coll.]

Tabulated data showing the plants for which each trace element is essential, the possible biological function in the plant, deficiency symptoms and diseases in the plant and country where disease is known. Data concerning the last two items are also tabulated with regard to animal nutrition.

[1516] 631.811.9:546.47:631.85:631.821.1.
ROGERS, L. H.; WU, C.-H. **Zinc uptake by oats as influenced by application of lime and phosphate.** *J. Amer. Soc. Agron.* 40, 1948 (563-566). [Fla. Agric. Expt. Sta., Gainesville]

A number of crops grown on several soil types in Florida have shown signs of Zn deficiency. The Zn content of plants decreased with increasing rates of P applied to the soil. There was no significant increase in weight of oats at the first cutting; at the second cutting small applications of P had

little effect, but with applications of 1000-1500 lb./acre weight increased significantly. Zn content decreased with increasing applications of lime.

Zn applied at 50 lb./acre gave no significant increase in Zn content of oats at the first cutting, but at 100-200 lb./acre the increase was highly significant. Zn applications gave no significant increase in weight and there were no visible effects during the growing season.

631.812/3 PROPERTIES OF FERTILIZERS

[1517] 631.812/3
RADER, L. F., JR. **Composition and characteristics of the solution phase in mixed fertilizers.** *Amer. Fert.* 108, No. 12, 1948 (7-9, 26, 28, 30). [U.S.D.A., Beltsville]

Mixed fertilizers that had varying amounts, sources and proportions of N and varying amounts of muriate of K in the 5-10-X grades were prepared at different moisture levels. The mixtures contained super. as the source of P, 100 lb. of organic conditioner and 200 lb. of dolomite per ton and were adjusted to 2000 lb. with quartz sand. Curing times ranged from a few days to several months. Examination of the displaced-solution phase of the 5-10-4 mixtures showed that its water content varied from 32.9% to 51.6% when the moisture content of the samples varied from 3% to 9%, while the portion of sample in solution ranged from 5.9% to 26.4%. The uramon- NaNO_3 combination was more hygroscopic than uramon- NH_4NO_3 and $-(\text{NH}_4)_2\text{SO}_4$. Solution phases comprised chiefly NH_4 , NO_3 , Cl, $\text{CO}(\text{NH}_2)_2$ and water with very little K^+ , Na^+ or PO_4^{3-} . Increases in moisture content resulted in the solution of increasing amounts of each constituent. The solution phases of all mixtures were acid.

Moisture in the solution phase varied from 67.8% to 69.3% when the sample contained no N, from 28.8% to 50% in the 5-10-4 and 5-10-8 grades, and from 40.4%-50.4% with no K. The portion of sample in solution was greatest for mixtures containing most NH_4NO_3 of which increasing amounts raised the hygroscopicity of the solution phase as did decreasing amounts of K. In no-N samples the solution phase contained 1.3% to 0.9% Ca and 3.4% to 1.9% Mg for sample water contents of 3% to 9%. The amount of SO_4^{2-} in solution varied inversely with the amount of K in the sample.

The data indicate that curing reactions involve the formation of relatively insoluble complexes of alkalis and alkaline earths with probably SO_4^{2-} and PO_4^{3-} and possibly NO_3^- , the completeness of the reaction in a given time being determined by the amount of moisture present. Greater amounts of moisture at mixing times also cause a greater portion of the sample to be in the solution phase which is therefore less hygroscopic. During mixing, new compounds may be formed with more desirable physical properties than those of the original compounds, e.g., the formation of the less hygroscopic $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{CO}(\text{NH}_2)_2$ and $(\text{NH}_4)_2\text{SO}_4 \cdot 2\text{NH}_4\text{NO}_3$.

631.816 FERTILIZER APPLICATION

(See also Abs. No. 1647)

[1518] 631.816.3
STEWART, A. B. **Placement of mineral nutrients in soils.** *XIth Internat. Congr. Pure Appl. Chem.* 1947 (351-355). B.A. BIII. 1948 (112).

Most inorganic N compounds are readily soluble and mobile in soil, but phosphates quickly form insoluble compounds and tend to remain where placed in the soil. They are likely to be more effective when placed close to the seed than when broadcast. Some trace elements, e.g. B, can be applied directly as fertilizers; others, e.g. Fe, are best applied as foliage sprays.

[1519] 631.816.3 : 631.67
MCCOLLAM, M. E.; FULLMER, F. S. **Applying fertilizers in solution.** *Better Crops* 32, No. 6, 1948 (6-8, 46-47).

Fertilizers and soil amendments, which are now distributed in the Western States for application in irrigation water include NH_3 , SO_2 and liquid P_2O_5 ; K_2S and tetra K pyrophosphate show considerable promise. Liquid mixed fertilizers contain NH_4NO_3 , $\text{CO}(\text{NH}_2)_2$ or KNO_3 , P_2O_5 , NH_4 phosphate and KCl. Wetting agent or a soil flocculant may be added to increase penetration and rose stone is used with anhydrous NH_3 to prevent precipitation of insoluble carbonates. Methods of transport and application are outlined.

[1520] 631.816.34 : 632.191
SCOTT, C. E. **Field tests of fruit trees for micronutrient deficiencies.** *Agric. Chem.* 3, No. 5, 1948 (35, 37, 39).

The use of limb injections with dry salts into the *sapwood* is a reliable test for deficiencies of B, Mn, Fe, Cu and Zn in deciduous trees. With branches up to 4 inches in diameter, one 7/16-inch hole a foot above the base of the branch is provided with 1½ gm. of borax or the appropriate sulphate and closed with wax. The untreated branches are available for comparison. With larger branches, the holes should be spaced at 3½ inches apart around the branch. For curative treatments, B is applied through the soil except in special cases such as the sudden appearance of blossom killing and die-back in pears, in which prompt application by spraying is required. Fe is applied as a dry ferric-citrate injection and Mn as a foliage spray or to the soil. With Zn deficiency where the fixing power of the soil is high, all the stone fruits except cherry are corrected by dormant applications of ZnSO₄ spray. With cherry and walnut, pieces of galvanized iron should be driven into the trunk and limbs.

631.82 MINERAL AMENDMENTS.

LIME

[1521] 631.821
BRUIN, P.; ROWAAN, P. A. De inwerking van verschillende kalk- en magnesiumstoffen op een zuren, humeuze zandgrond, mede in verband met haar fijnheid. [The effectiveness of various liming and magnesia materials on an acid sandy soil rich in humus, and the effect of degree of fineness.] *Landbouwk. Tijdschr.* 59, 1947 (5-17). [Du.e.]

Slaked lime had the most rapid and complete effect on the soil, ground and dolomitic limestone ^{was} slower and ground blast-furnace slag ^{was} still slower. Loss of Ca from the upper layers of the soil was greatest in the case of the carbonates due to leaching of the Ca(HCO₃)₂ formed by the reaction of humus and CO₂. Efficiency increased with decreasing particle size; the percentages of exchangeably adsorbed Ca were also affected by particle size. Activity values, i.e. the proportion of exchangeably adsorbed to added lime, after one year were ⅘ from

slaked lime and ¾ for ground limestone, and the calculated quantity of lime required to raise the pH by a certain amount should be divided by these values.

[1522] 631.822
UTESCHER, K. Bodenverbesserung durch Aufschlickung. [Soil improvement by sliming.] *Ztschr. Pflanz. Düng.* 38, 1947 (35-39). [G.]

Lake slime taken from within 50 m. of the bank from depths of 1-3 m. where the bottom lay ½-2 m. below the water level was rich in organic substances (16-65%) and in N and contained 0.4-60% of chalk. The slime was suitable for soil neutralization and for increasing the N, lime and humus content, but as its composition is not uniform, a chemical analysis is desirable in each case. The slime was low in K₂O (0.16-0.19%) and P₂O₅ (0.02-0.05%) and these nutrients should be added. The slime should be allowed to freeze in small heaps in winter, to oxidise sulphides and improve its structure.

[1523] 631.822 : 552.323.5
MARTIN-LEAKE, H. **Soil rejuvenation in Mauritius.** *Int. Sug. J.* 50, 1948(90-91).

A review of O. d'Hotman de Villiers' paper on his experiments with ground basalt with references to R. Albert's experiments with crushed basalt in Germany. It is suggested that the effect of basalt may be due partly to the trace elements it contains and partly to its radio-activity. It may modify the soil physically and the mycorrhiza with which sugar cane is associated.

[1524] 631.828 : 546.56 : 581.192
LUCAS, R. E. **Effect of copper fertilization on carotene, ascorbic acid and copper contents of plants grown on organic soils.** *Soil Sci.* 65, 1948 (461-469). [Mich. Agric. Expt. Sta.]

In pot experiments Cu treatment resulted in greater increases in yield of spring- than of autumn-grown spinach while increases in ascorbic-acid content were higher in autumn; an increased carotene content was the only apparent effect on field-grown spinach and wheat at the preheading stage. The carotene and ascorbic-acid contents of barley and carrots were significantly increased, the effect diminishing as maturity advanced. Cu treatment of tomatoes increased the yield

by more than 30%, but did not affect ascorbic-acid values, while the yield, ascorbic-acid and carotene contents of greenhouse-grown oats were greatly increased, especially on an unlimed muck.

The symptoms of Cu and N deficiencies were similar, but the protein and nitrate-N contents of Cu-deficient plants were at least adequate and suggest that there was no interference in the conversion of carbohydrate to protein. The role of Cu is probably connected with the early stages of food synthesis.

631.84 NITROGEN FERTILIZERS

[1525] 631.841.1 : 631.813
AGRICULTURAL CHEMICALS. Ammonium sulphate. *Agric. Chem.* 3, No. 5, 1948 (28-29, 78, 79).

The caking tendency of $(\text{NH}_4)_2\text{SO}_4$ is affected by crystal size, which can be closely controlled by the new Koppers process. The uniformly-sized dry neutral salt containing 50-75% by weight of crystals on a No. 30 U.S. standard sieve will provide the optimum drillability either in the mixed or unmixed form.

[1526] 631.841.1 : 631.813
JENSEN, S. T.; KJAER, B. Kvaelstofftab ved Ammoniakfordampning af Gødskning med Svovlsur Ammoniak. [Loss of nitrogen by ammonia evaporation when manuring with ammonium sulphate.] *Tidsskr. Planteavl* 51, 1948 (666-711). [Da.e.]

N losses caused by evolution of NH_3 from ammonium sulphate are generally much smaller than those sustained by spreading solid or liquid manure. The risk of loss increases with the temperature, pH and CaCO_3 content of the soil and decreases with the moisture content. Clay and humus colloids prevent evaporation by absorbing NH_3 . Serious losses may occur from highly calcareous, dry, sandy soils.

[1527] 631.841.7
CLARK, K. G.; YEE, J. Y.; LOVE, K. S. New synthetic nitrogen fertilizer. Preparation and properties of urea-form. *Indust. Engng. Chem.* 40, 1948 (1178-1183). [U.S.D.A. Beltsville, Md.]

Urea-formaldehyde reaction products suitable for fertilizer use (urea-form) that contain 36% or more of N and have varying

rates of availability have been produced from dilute and concentrated solutions having urea-formaldehyde mole ratios of 0.75-7.5 under various conditions of acidity, reaction temperature and time. Relatively simple and highly efficient processes may be devised for the rapid production of urea-form having predetermined N solubility and rate of availability to plants.

631.85 PHOSPHATE FERTILIZERS

[1528] 631.851
POULSEN, J. F. Studier over forskellige Fosfaters Gødningsvaerdi. II. Om nogle Ferriog Aluminiumfosfaters Gødningsvaerdi. [Studies on the manurial value of different phosphates. II. The manurial value of some iron and aluminium phosphates.] *Tidsskr. Planteavl* 51, 1948 (616-639). [Da.]

In two-year pot-culture experiments with barley, Al and Fe phosphates precipitated under varying conditions and used either freshly precipitated, dried or ignited, were compared with superphosphate and a Reno phosphate. Data are given of yields, P uptake and available P of soils determined by either the citric-acid or Petermann's citrate method. Freshly precipitated Fe and Al phosphates had a considerable effect on yields and on the available-P content of the soil, but dried or ignited ferric phosphate did not increase the available-P content of the soil and had only a small effect on yields. Correspondingly treated Al phosphates increased yields, but not the available-P content of the soil. In differentiating between the materials the citric-acid method was superior to the citrate method, although somewhat overestimating all the ferric phosphates. The amount of citric-soluble ferric phosphate varied with the pH at which precipitation had taken place. No such relationship was found when using Petermann's citrate method.—S.H.

[1529] 631.851 : 545
HELDRICH, K.; RIEMEN, W. Determination of phosphorus in phosphate rock. *Anal. Chem.* 19, 1947 (651-652). B.A.C. 1948 (38).

A HCl solution of the rock is evaporated, the residue baked to remove HF and to dehydrate SiO_2 and extracted with dilute

HCl. The solution obtained is passed through a H-saturated cation-exchange resin and the effluent, which contains only HCl and H_3PO_4 , adjusted to pH 4.63. The NaH_2PO_4 thus formed is titrated with NaOH to pH 8.98, i.e., to the Na_2HPO_4 stage.

631.86/7 ORGANIC FERTILIZERS

(See also Abs. Nos. 1393, 1398, 1423, 1645, 1678)

[1530] 631.86/7: 631.81
JANSSON, S. L. Reformtendenser inom jordbruket. [Reform tendencies in agriculture.] *Kgl. Lantbr.Akad. Tidskr.* 87, 1948 (129-160) [Sw.e.]

A review of the doctrines of Sir A. Howard, Lady Eve Balfour, Rudolf Steiner and others who opine that "organic farming" is the only road to salvation.

[1531] 631.86: 577.16
LE RICHE, F. J. H. Studies on the processing of vegetables. IV. Studies on the ascorbic acid content of cabbage varieties. *S. Africa Dept. Agric. Sci. Bull. (Fruit Res. Tech. Ser.)* 261, 1947, pp. 11.

Kraal manure was applied at rates of 20 and 40 tons per morgen to 18 varieties of cabbage in sandy soil. With the exception of 4 varieties higher concentrations of ascorbic acid were found in plants treated with the higher rate of manure.

[1532] 631.871: 631.417
GERICKE, S. Die Bedeutung der Ernterückstände für den Humushaushalt des Bodens. [The significance of harvest residues for the humus economy of the soil.] *Ztschr. Pflanz. Düng.* 37, 1946 (46-61). [G.] [Berlin-Dahlem]

Harvest residues of common cereals consisted of about 60% roots and 40% stubble. Oats and winter cereals had considerably more residues (30-35 dz./ha.) than spring cereals (20 dz./ha.). The amount of residues, both roots and stubble, was increased by fertilizing, especially with P and K. Inorganic fertilizers thus contribute to increasing the humus supply of a soil. Roots and hoed crops averaged about 10 dz./ha. of harvest residues, vegetables 6, red clover 36, and lucerne 85. It is calculated that under average German conditions 60% of the

organic-matter additions to soils under cereal culture come from harvest residues and 40% from organic manures, whereas under vegetable culture 35% comes from harvest residues and 65% from manure. As there is evidence that the total organic-matter additions to cultivated soils are barely sufficient to maintain the humus content, harvest residues must play an important role in maintaining soil fertility.

[1533] 631.874: 631.417-4
PINCK, L. A.; ALLISON, F. E.; GADDY, V. L. Utilization of nitrogen in cropping systems with and without green manure in the greenhouse. *Soil Sci.* 66, 1948 (39-52). [U.S.D.A., Bur. Pl. Indust., Beltsville, Md.]

A long-term greenhouse experiment was undertaken to decide whether it was preferable to add fertilizer N to a green-manure crop or to apply all the N directly to a growing major crop. The addition of urea N to soils for the production of green-manure crops resulted in the fixation of a large percentage of the added N so that it was not recovered in the indicator crops during the experiment. The yields of successive crops and the final soil-N determination after a year of fallow show that N was being released, but only slowly. The largest yields and highest recoveries of N were obtained where no green-manure crops were turned under; less than 50% of the N applied to indicator crops was recovered in the harvested parts and the rest went in the production of soil-organic matter. Where 40 and 80 lb. of N were used to grow green crops, the comparative N recoveries in the indicator crops showed no marked differences. The extra N merely produced more green crop and thus inactivated more N, except where the green crop was turned under while very young.

Soil analyses showed that the addition of N alone to the soil increased the quantity of soil carbon. After adding N for 4 years the gains of C from root residues increased to 24% and where mature green crops were added gains were 54%. For young, intermediate and mature green crops and for no green crop the average C/N ratios of the humus formed were 9.4, 10.2, 11.8 and 12.6 respectively, and the percentages of C added as green manures and roots that remained in the soil at the end of the experiment were 25.9, 21.7, 20.9 and 37.1 respectively.

Under field conditions increases in soil C would be less, but the principles involved would have general application.

[1534] 631.875:631.811.1
BOULD, C. Availability of nitrogen in composts prepared from straw and town refuse treated with sewage sludge. *Int. Cong. Pure Appl. Chem.* 11, 1947. B.A.BIII (127).

Availability of N in the composts was low, the values ranging from 10-20%. Additional response from most crops was obtained by supplementing the compost with artificial N.

[1535] 631.875:631.813
GÖSSL, V. Příspěvek k mechanicko-fyzikálnímu hodnocení kompostů. [The mechanical and physical evaluation of composts.] *Sborn. Čsl. Akad. Zeměd.* 19, 1946 (296-302). [Cz.e.r.]

[1536] 631.876.9:633.61
PROCEEDINGS OF THE MEETING OF BRITISH WEST INDIES SUGAR TECHNOLOGISTS. Composting of filter press mud and surplus bagasse with distillery slops for use as fertilizer. *Proc. Meet. B.W.I. Sug. Tech.* 1947 (79-80). *Int. Sug. J.* 50, 1948 (186).

A discussion principally on the cost of producing compost heaps. The composition of the compost would vary greatly and the rate of application would vary accordingly. When the composition was similar to that of filter-press mud a dressing of 4 to 5 tons/acre was usually sufficient, and when similar to that of pen manure the optimum dressing was 10 to 12 tons/acre. Bagasse can be safely used as a mulch on some soils such as the sandy loams of St. Kitts, whereas on the clays of Antigua and Trinidad a bagasse mulch caused yellowing of cane.

[1537] 631.879.2:631.671
WILCOX, L. V. Agricultural uses of reclaimed sewage effluent. *Sewage Works J.* 20, 1948 (24-33). C.A. 42 (3881). [U.S. D.A. Riverside, Calif.]

The properties which determine the quality of water for use in irrigation are discussed. Data of analyses of typical irrigation water and typical effluents are given, and the quality of such effluent is discussed. B in

amounts greater than 1 p.p.m. is particularly harmful to plants, and many industrial wastes in a city sewage may make it toxic to plants.

632 PLANT DISEASES. WEEDS AND PESTS. PLANT PROTECTION

(See also Abs. Nos. 1557, 1588, 1608, 1640, 1696)

[1538] 632.2:631.415.1
STEVENSON, W. Effect of acids on a soil nematode. *Parasitology* 36, 1945 (158-164). C.A. 42 (4704).

The toxicities of 0.206 n. acids were measured and their effects described. These results showed that mineral acids had markedly greater effect than the organic acids and the importance of the former was further illustrated by using mixtures of HCl containing varying amounts of organic acids.

[1539] 632.536
CULLITY, M. The bracken fern and its eradication. *J. Dept. Agric. W. Aust.* 25, 1948 (34-43).

Bracken fern is gradually occupying increased areas in Western Australia. It is usually prevented from becoming a serious pest on small well-worked properties by methods of control including burning, sowing subterranean clover after burning the paddock and top dressing with super., pasturing stock, cutting, mowing and rolling. Chlorates of Na and Ca are effective, but the amount necessary and the high price make this method prohibitive.

[1540] 632.554.21:632.954
CARLSON, R. F.; MOULTON, J. E. Use of the ammonium salt of trichloroacetate, the sodium salt of trichloroacetate, ammonium thiocyanate, and herbicide "PB" in the eradication of grasses, and the effect of these chemicals on strawberry and raspberry plants. *Mich. Agric. Expt. Sta. Quart. Bull.* 30, 1948 (413-421).

Several water-soluble compounds were tested in a greenhouse in order to find an effective herbicide to control quack grass (*Agropyron repens* L.) by application to the foliage. The ammonium and Na salts of TCA were equally effective, but their herbicidal action was slow. Approximately

150-200 lb./acre were required for a complete kill of well established grass. A wetting agent did not materially increase the effectiveness. Ammonium thiocyanate (ATC) was not as effective as the two salts of TCA. "PB" was effective on broad-leaved weeds but did not injure the grasses.

Strawberry plants were killed when herbicidal concentrations were used. The effects produced on raspberry plants were outgrown. The ammonium salt of TCA in moist soil remained toxic to red kidney beans 40 to 50 days following soil applications.

[1541] 632.554.21 : 632.954
GRIGSBY, B. H. **Selective control of crabgrass (*Digitaria* sp.)** *Mich. Agric. Expt. Sta. Quart. Bull.* 30, 1948 (369-373).

Tests with the use of petroleum base compounds L-2687 and L-2988 showed that the two compounds had under the climatic conditions of the experiment a highly specific toxicity to crabgrass and other susceptible plants. Using a rate of application of 1 quart per 100 square feet during a mild, moist spell a complete kill of crabgrass was obtained in 5-8 days. Bluegrass in the plot showed no effects from the spraying, Bermuda grass showed a slight colouration not associated with the death of any leaves. With dry soil, high temperatures and no rain, the same rate of applications killed the crabgrass, but also caused some injury to the bluegrass which, however, recovered completely with the occurrence of lower temperatures and rainfall.

[1542] 632.579
MEADLY, G. R. W. **Cape tulip.** *J. Dept. Agric. W. Aust.* 25, 1948 (22-28).

Two species, *Homeria collina* (Thunb.) Vent. and *H. miniata* Sweet, native to South Africa are now serious weeds in many parts of Australia. Both species are toxic. Chemical sprays have not proved very successful, and the most effective control measures are grubbing and ploughing.

[1543] 632.594.2
ORCHARD, H. E. **Field bindweed (*Convolvulus arvensis*, L.)**. *J. Dept. Agric. S. Aust.* 51, 1948 (373-376).

Bindweed can be eradicated with (1) applications to the soil of dry salt at $\frac{1}{2}$ -1 lb./sq. foot, which makes the soil unproductive for

several seasons; (2) sprays of NaClO_3 at 100-300 gallons/acre (1 lb. NaClO_3 to 1 gallon of water) at full flowering stage; (3) sprays of 2 gallons of Methoxone or 2,4-D in 100 gallons of water.

[1544] 632.594.2 : 631.432.2
STAHLER, L. M. **Shade and soil moisture as factors in competition between selected crops and field bindweed, *Convolvulus arvensis*.** *J. Amer. Soc. Agron.* 40, 1948 (490-502). [U.S.D.A. Bur. Pl. Indust. and Minn. Expt. Sta.]

Where there is competition for soil moisture bindweed develops at the expense of almost all crops. Where moisture can be conserved or is ample and where soil nutrients are plentiful, light is a prime factor in competition between bindweed and crops. Autumn-sown rye or wheat intercepts so much light that growth of bindweed is hindered. Lucerne is recommended for bindweed control as it competes most successfully for soil moisture, nutrients and sunlight. Millet, sorghum, soybeans and Sudan grass, planted in midsummer, grow rapidly and maintain a deep dense canopy against which bindweed cannot compete.

[1545] 632.651.6
EVANS, A. C. **The importance of earthworms.** *Farming* 2, 1948 (59-60, 50).

The numbers, weights and kinds of earthworms present in agricultural soils vary with the food supply, previous cropping history of the land, and soil type. On a field which has been under arable cultivation for more than 100 years, a plot receiving 14 tons/acre per annum of farmyard manure carried approximately 450 lb./acre of earthworms and a plot receiving complete fertilizer with a yield of wheat equal to that of the manured plot carried 110 lb./acre of earthworms. Permanent pasture carries the greatest weight of earthworms, approximately 800-1000 lb./acre. During the first year after ploughing there is little change in the earthworm population. After the first year there is a rapid decline in numbers and by the fifth year only 50-100 lb./acre are present. Leys carried 200-700 lb./acre according to age. Permanent pastures have a high proportion of large species, arable fields of small species, and leys are intermediate. On farmlands the highest population occurred on light

loams and the lowest on clay and gravelly sand. Acid hill pastures contained about 52,000 worms per acre, mostly a small species rarely found in good pastures. When this land was ploughed, limed, fertilized and reseeded to grass, the earthworm population increased 3-4 times, the increase consisting chiefly of species associated with good pastures.

6-16 tons/acre of soil per year was thrown up in the form of wormcasts on a 70-year-old pasture. Annual wormcast production varied from 1-2 tons on leys 1-7 years old to 25 tons on 300-year-old pasture. Only 2 species out of 6 or 7 commonly found were responsible for producing wormcasts.

Due to earthworm activity there was with increasing depth an increase in the amount of coarse sand relative to silt and clay in pastures, but not in a 7-year ley after arable. The pore space of the top 4 inches was 56% in pastures, 40% in the ley and 45% in arable fields after stubble.

[1546] 632.651.6 : 631.4
GUILD, W. J. M. **Studies on the relationship between earthworms and soil fertility. III. The effect of soil type on the structure of earthworm populations.** *Ann. Appl. Biol.* 35, 1948 (181-192). [Rothamsted]

Light and medium loams have higher total populations of earthworms than the heavier clay types or more open gravelly-sand or alluvial types. Species numbers vary with soil type. On acid natural pastures earthworm populations are low and consist mostly of small active species which are not found in well-established fields. When agricultural treatment improves an area the acid-pasture species decrease in number and importance as the species associated with good pasture become established.

[1547] 632.7 : 631.51
REGNIER, R.; GUEIT, M. **Les vers blanc et les façons culturales. [White worms and methods of cultivation.]** *Bull. Soc. Sci. Nat. Rouen* 66, 67, 1940-41 (117-122). [F.]

Cockchafer grubs (*Melolontha melolontha* L.) are found in large numbers in the upper layers of the soil, at a depth of 4-5 cm. during the summer and early autumn. It should therefore be possible to destroy them during these times by cultivation of the soil, using

a disc cultivator; by this method at least 70% of the grubs were killed. Destruction of the grubs may be completed by the use of harrows and rollers.

[1548] 632.765 : 631.4
ROSS, D. M.; STAPLEY, J. H.; COCKBILL, G. F. **Wireworm populations in relation to crop production. V. Comparisons between failing and successful plots.** *Ann. Appl. Biol.* 35, 1948 (193-206). [Sch. of Agric., Univ. Cambridge]

When data were collected on wireworm populations, chemical and mechanical composition of the soil, feeding reactions of the wireworms collected, agricultural history and treatment of the different plots and fields, in only 6 out of 13 fields did the damaged areas coincide with areas of high infestation. CaCO_3 was consistently high and sand content consistently low on failing plots and this was particularly marked in fields where differences in infestation were not detected. From 4 fields there was a suggestion that wireworm attack commonly follows sainfoin. None of the other factors showed significant relationships.

632.95 INSECTICIDES. FUNGICIDES. HERBICIDES

(See also Abs. Nos. 1478, 1479, 1540, 1558, 1573, 1599, 1600)

[1549] 632.951/3
MARTIN, J. T. **Pest control in agriculture.** *Repts. Prog. Appl. Chem.* 32, 1947 (335-346). [Pl. Path. Lab., Harpenden]

Progress of work is reviewed on DDT, benzene hexachloride and other chlorinated compounds, organic phosphorus compounds, azobenzene and plant products and on soil insecticides for the control of nematodes and wireworms.

[1550] 632.951
CARNE, P. B. **Experiments in the use of DDT against the pasture cockchafer, *Aphodius howitti* Hope.** *Aust. J. Coun. Sci. Indust. Res.* 21, 1948 (1-6).

DDT was used as a dust containing 2% of the *p*, *p*-isomer in talc, and was applied at the rate of 166 lb./acre. Population counts using 180 one-square-link quadrats showed poor control at two months and almost 100%

control at eleven months after treatment. It appears that the DDT must have persisted in the soil for at least six and probably eight months and killed first instar larvae of the generation next to that present at the time of treatment.

[1551] 632.951: 631.547.2
FLEMING, W. E. **Effect on plants of DDT applied to soil for the destruction of Japanese beetle larvae.** *U.S.D.A. Agric. Res. Admin. Bur. Ent. Pl. Quarantine E-737*, 1947, pp. 20. C.A. 42 (5159).

Tests were made to determine whether various plants could be grown without serious injury in soil treated with 25 lb. of technical DDT per acre or 27 gm. per cubic yard. The plants are listed into 6 groups. Nursery and greenhouse plants fell into three groups, those which grew normally, those whose reaction could not be determined for various reasons and those whose growth was retarded. One group of vegetables grew normally, another was retarded. In the sixth group were cereals and grasses which grew normally.

[1552] 632.954
CRAFTS, A. S. **Results of soil treatment vs. contact sprays in corn and cane.** *Agric. Chem.* 3, No. 5, 1948 (25-27, 81, 83, 85). [Porto Rico Agric. Expt. Sta.]

The successful use of 2,4-D as a pre-emergence treatment to control weeds in sugar cane and maize is determined by rainfall conditions. If heavy rain or no rain followed the treatment, the chemical would become leached or would fail to reach the weed roots, while light rainfall, which would cause high concentrations in the topsoil, might seriously injure the smaller crops. Moderate rainfall would be the most favourable for weed control. It is suggested that a 1:1 mixture of 2,4-D acid and its Na salt might be effective under a wide range of rainfall conditions, the acid being less easily leached than the salt.

Where the use of 2,4-D is inadvisable or has resulted in failure because of cloddy land, unfavourable weather, use of less resistant varieties of maize or the prevalence of grasses, a fortified oil-emulsion contact spray may be used 1-2 days before emergence, and again when the crop is 12 inches and 2½-3 feet high, care being taken to avoid spraying the tops. The spray consists of a mixture

of 30 lb. of an aromatic oil, 2 lb. of penta-chlorophenol or 1 lb. of dinitro secondary butyl or amyl alcohol, and 2 lb. of Oronite stabilizer, in 100 gallons of water.

[1553] 632.954
CRAFTS, A. S.; REIBER, H. G. **Herbicidal properties of oils.** *Hilgardia* 18, 1948 (77-156).

A preliminary survey of the properties of herbicidal oils and an investigation of the relationship between toxicity and chemical composition are described.

[1554] 632.954: 577.17
HAMNER, C. L.; KIANG CHI-KIEN. **Use of a plastic material to increase the action of the sodium salt of 2,4-D.** *Science* 107, 1948 (572-573). [Mich. St. Coll.]

The effect of the Na salt of 2,4-D on kidney bean was greatly enhanced by application of Geon 31X latex, a p.v.c. plastic material, either separately from or together with the 2,4-D. A similar effect was observed with oat seedlings.

[1555] 632.954: 577.17: 631.461.3
JONES, H. E. **The influence of 2,4-dichlorophenoxyacetic acid on nitrate formation in a prairie soil.** *J. Amer. Soc. Agron.* 40, 1948 (522-526). [Kans. Agric. Expt. Sta., Manhattan]

There were no indications that rates of 2,4-D up to 25 lb./acre had very detrimental influence on nitrate production in a soil to which no N had been added, but when N in the form of urea or NaNO₃ was added to soil treated with 2,4-D, 15 lb./acre of 2,4-D was sufficient to inhibit temporarily the formation of nitrates. Urea is rapidly hydrolysed to NH₃ and the ammonia N is then immediately oxidized to the nitrate form. 2,4-D retards this hydrolysis for the first 2-3 weeks.

[1556] 632.954: 577.17: 631.557
STONE, N. E. VAN. **Chemical weed control.** *Agric. Chem.* 3, No. 4, 1948 (33-36, 79, 81).

United States losses through weeds are estimated to be £450,000,000 per year. Estimates of probable improvements from the general use of 2,4-D include an increased carrying capacity of up to 25% in grasslands and a 15-100% increase in grain yields,

depending on the degree of weed infestation. In Canada in 1948, 7,000,000 acres of wheat will be treated to produce an expected increase, through weed control, of 3 bushels/acre of grain.

633.1 CEREALS

(See also Abs. Nos. 1552, 1577, 1670, 1692, 1709)

[1557] 633.1-2.4-1.4
TAPKE, V. F. **Environment and the cereal smuts.** *Bot. Rev.* 14, 1948 (359-412). [Pl. Indust. Sta., Beltsville, Md.]

Soil moisture of 15-60% of the water-holding capacity favours infection which is reduced in exceedingly wet or dry soils. Optimum soil-moisture content varies according to soil type. Sandy soils and humus-rich soils favour infection, and clay, peat and highly acid soils are unfavourable. Fertilizers containing K and P, and compost stimulate the production of bunt; lime, N and cyanamide reduce bunt.

[1558] 633.1-2.954: 577.17
GRIGSBY, B. H.; CHURCHILL, B. C. **Effect of 2,4-dichlorophenoxyacetic acid on oats and barley varieties.** *Mich. Agric. Expt. Sta. Quart. Bull.* 30, 1948 (448-451).

The results indicate that there may be varietal differences in the response of small grains to 2,4-D, as one variety of oats had its germination less severely affected than another. Oats and barley sprayed at the rates of $\frac{3}{4}$, $1\frac{1}{2}$ and 2 lb. of 2,4-D-acid equivalent per acre when the plants were 4-6 inches high did not show any evidence of injury to vegetative tissue, whereas these rates killed ragweed, mustard, yellow rocket and rough pigweed. Seedling clover was killed by all 2,4-D treatments, but not by Dow selective weed killer. Germination of barley was not reduced by either of these treatments.

[1559] 633.11: 546.56: 546.47
DUNNE, T. C.; THROSSELL, G. L. **Responses of wheat to copper and zinc at Dongara.** *J. Dept. Agric. W. Aust.* 25, 1948 (43-46).

Cu and Zn when used with super. gave statistically significant increases in yields of $3\frac{1}{2}$ bu./acre over the control. A much more striking increase of nearly 14 bu./acre was obtained when both were used in combination.

Observations suggested that the beneficial effect of Zn was due to increased vegetative growth whereas Cu was needed to ensure the formation of grain.

[1560] 633.15-1.5
BRUNSON, A. M.; SMITH, G. M. **Popcorn.** *U.S.D.A. Farm. Bull.* 1679, 1948, pp. 18.

Recommendations on soils, rotations, fertilizers and cultivating are included.

[1561] 633.15-1.81
FERTILIZER AND FEEDING STUFFS JOURNAL. **South African Industry. Fertilizer trials with maize.** *Fert. Feed. J.* 34, 1948 (401).

Experiments at Potchefstroom College of Agriculture have shown that super. when used alone on maize yielded as good results as when either N, K or lime was added. Yields were increased only slightly with rock phosphate during the first few years after application, but after 8-10 years yields improved and were equal to or better than those from super. Yields from land on which kraal manure was used alone were the same as those on which super. was used. Best yields were obtained when kraal manure and super. were used together. The addition of N did not benefit maize and the increased yield obtained from the use of kraal manure is ascribed to its P content and not to its N content.

[1562] 633.15-1.816.32
ROBERTSON, L. S.; COOK, R. L. **Efficiency in the use of fertilizers for corn.** *Mich. Agric. Expt. Sta. Quart. Bull.* 30, 1948 (374-377).

Maize did not respond to large quantities of P and K fertilizer applied to lucerne during the summer preceding the ploughing of the land for maize. The data from a series of fertilizer-placement experiments have shown that significant yield increases were obtained with fertilizer placed in bands to the side of and below the seed. The placement of fertilizer with the conventional maize planter did not produce significant increases in yield. No specific depth can yet be recommended except that the fertilizer be placed below the seed. Fertilizer ploughed down does not give as good results as fertilizer placed below the seed at planting time. Fertilizer placed in one band at the side of the seed is as effective as fertilizer placed in bands on each side of the seed.

[1563] 633.17-1.612
QUEVEDO, C. V. El empleo de los sorgos contra la erosión. [The use of sorghums in preventing erosion.] *Noticioso B. Aires* 12, 1947 (256). Herb. Abs. 18 (130). [Sp.]

Trials have shown *Sorghum alnum* L.R. Parodi, *S. sudanense*, *S. caffrorum* and *S. saccharatum* to be highly efficient in stabilizing shifting sands and to give good yields on land where no other crops can grow.

[1564] 633.18-1.3
ALLEN, E. F.; BEWLAY, E. W. Investigations into the mechanical cultivation of wet padi on peat soils in the State of Perak. *Malay. Agric. J.* 31, 1948 (37-43).

The land, which consisted of soft peat, 1-3½ feet deep overlying sandy clay, was cleared of stumps. Of various disc-ploughs and harrows a medium-size cut-away disc harrow was the most successful for cultivation as it was of suitable weight and effectively cut up and buried the lalang grass. Drilling was attempted successfully. Weasel amphibious cargo carriers formed the only type of tractor capable of working on the soft peat soil.

[1565] 633.18-1.3
BERWICK, E. J. H. Interim report on exploratory investigations into the mechanical cultivation of padi. *Malay. Agric. J.* 31, 1948 (20-25).

The conclusions drawn from investigations on the mechanical cultivation of wet and dry padi in Malaya are reviewed. Costs are tabulated.

[1566] 633.18-1.3
CURRY, J. R. Investigations into the mechanical cultivation of wet padi on coastal clays in the State of Pahang. *Malay. Agric. J.* 31, 1948 (34-36).

Metal-wheeled tractors and disc ploughs were most satisfactory for the areas investigated which comprised old padi fields carrying swamp grasses. Conditions were dry. Heavy growth of weeds makes a long interval between ploughing and planting undesirable.

[1567] 633.18-1.3
DEPARTMENT OF AGRICULTURE, MALAYAN UNION. Investigations into the mechanical cultivation of wet padi with horticultural tractors. *Malay. Agric. J.* 31, 1948 (44-46).

Various low-h.p. implements were tested.

Although a rotary hoe left the coastal clay soils in a satisfactory condition, regrowth of weeds was such that it was necessary to revert to the whole process of manual cultivation. Rotary hoeing would probably be satisfactory where sufficient water is available to drown the off-season weeds. The machine worked well on river alluvium under 1 inch of water with weeds not more than 3 inches high but could not cope with a heavy off-season growth of tough sedges and grasses on peat soils.

[1568] 633.18-1.3
SIMPSON, H. J.; HARTLEY, C. W. S. Investigations into the mechanical cultivation of wet padi on coastal clays in Province Wellesley. *Malay. Agric. J.* 31, 1948 (26-33).

Investigations were conducted under dry and flooded soil conditions on coastal clays where "pans" are of common occurrence, using 2 types of tractor, a light disc harrow, a 2-furrow mouldboard plough, a Cambridge roll, a 4-furrow disc plough and a cut-away disc harrow. Mechanical cultivation during the dry off-season was possible, but advantageous only if planting could be followed by an adequate supply of water. Otherwise the soil became consolidated and no suitable implement was found for the "after" cultivation of reconsolidated land. The mouldboard ploughs used in early ploughing worked too deep and turned up sub-soil; in such cases disc-ploughs were better. Sinking of the tractor caused bogging of all trailed implements used under soft conditions.

[1569] 633.18-1.3
SIMPSON, H. J.; KENDALL, T. A. Investigations into mechanical stumping and cultivation of dry padi on felled rubber land. *Malay. Agric. J.* 31, 1948 (52-56).

Cultivation of an area of heavy coastal clay mixed with peat from which rubber-tree stumps had been removed was investigated. Removal of tree roots was essential before eradication of lalang and before tillage could be carried out for which a disc plough followed by a heavy double-banked disc-harrow was excellent.

[1570] 633.18-1.3
SOPER, J. R. P.; MARSHALL, F. R. Investigations into the mechanical cultivation of dry padi on cleared land. *Malay. Agric. J.* 31, 1948 (47-51).

The mechanical cultivation of light sandy loam which had previously carried natural herbage, groundnuts or *Calopogonium* was investigated. Three cuts with a heavy double-disc harrow were sufficient to incorporate the cover in the soil. Light discs combined with chains behind the covering harrows served to consolidate the soil partially but not as much as was desired. Experiments on weed control have led to the conclusion that the weed problem is one of management and that no attempt should be made to grow dry padi by mechanical means unless the land is known to be clean.

[1571] 633.18-1.53
PALIS, G. T.; CALMA, V. C. Yields of broadcast and transplanted Seraup Kechil 36 rice. *Philipp. Agricst.* 31, 1948 (226-230).

Sprouting seeds were broadcast in the seedbed at a rate of two gantas to a 300-sq.-m. paddy and irrigated a week after emergence. Except for a higher sowing rate, seedlings for transplanting were grown similarly and pulled, bundled and pruned when 35-days old and transplanted in hills 25 cm. apart. The transplanted plants developed faster, were more uniform and greater in height, lodged earlier and matured later than those of the broadcast rice. Mean yields were 71.14 and 47.48 cavans per ha. for transplanted and broadcast rice respectively.

[1572] 633.18-1.81
CALMA, V. C.; RICO, S. G. Effects upon the yield of Ramai rice of ammonium sulfate, ammo-phos and a home-mixed fertilizer. *Philipp. Agricst.* 31, 1948 (216-221).

The fertilizers were broadcast two weeks after transplanting the rice seedlings on lowland clay loam containing 0.16% N, 0.20% P_2O_5 , 0.10% K and 1.40% Ca. Two weeks after application $(NH_4)_2SO_4$ and ammo-phos resulted in better stands of darker green plants than the home-mixed fertilizer which consisted of super. and K_2SO_4 . There was no significant effect on yield, probably due to shortage of water in the early stages and luxuriant weed growth on the fertilized plots. Calculations show that fertilizing resulted in financial losses and that fertilizers should be applied only when sufficient irrigation water is available.

[1573] 633.18-2.954: 577.17
AGRICULTURAL CHEMICALS. 2,4-D vs. weeds in rice. *Agric. Chem.* 3, No. 5, 1948 (55, 57).

Aeroplane applications of 2,4-D as dusts and sprays, using water and oil solutions, were made to 20- and 25-acre plots of rice in Texas. The sprays, especially triethanolamine salt in water, gave effective control, followed by Esteran and Weedone. Oil sprays caused slight temporary injury. The dusts, except isopropyl ester dust with oil, which gave effective control, became washed off by rain 6 hours after application and did not seriously damage the weeds (Mexican weed and tall and curly indigo). In field trials, the triethanolamine, NH_3 and Na salts and the butyl ester at rates up to 1 lb./acre in 50 gallons of water applied 3 weeks after emergence, gave good control. Yields were about the same as those of the control plots, except with NH_3 salt and butyl ester at 1 lb./acre, which depressed yields. All treatments 6 weeks after emergence gave good control except, with butyl ester at $\frac{1}{4}$ lb./acre, and significantly increased the yields, as did the triethanolamine salt 8 weeks after emergence.

633.2/3 GRASSES. LEGUMES

(See also Abs. Nos. 1548, 1586, 1600, 1684)

[1574] 633.2.03: 546.73
ROSSITER, R. C.; CURNOW, D. H.; UNDERWOOD, E. J. The effect of cobalt sulphate on the cobalt content of subterranean clover (*Trifolium subterraneum* L. var. Dwalganup) at three stages of growth. *J. Aust. Inst. Agric. Sci.* 14, 1948 (9-14).

Nine treatments were included in these experiments: three levels of Co application, together with three growth stages. Sheep grazing on an adjacent area were suffering from Co deficiency. The Co treatments had no influence on yield of clover over two years. On the untreated plots there were no significant changes in Co content of the subterranean clover at the different stages of growth, but on the plots treated with 8 oz./acre of $CoSO_4 \cdot 7H_2O$ the Co content of the clover decreased significantly at maturity during the year of application, but no such decrease at maturity was found with the 4 oz./acre rate.

A linear relationship between the amount of Co applied and Co content is suggested by the data and 3 oz./acre of hydrated $CoSO_4$.

annually or 6 oz. biennially is likely to give satisfactory results. Although this method is inefficient, as only about 1 per cent of the added Co was recovered in the plants over the two-year period, there are practical advantages in supplying Co to animals by way of the pasture; for example, it can be applied annually or biennially as part of the ordinary fertilizer mixture as "cobaltized" super.

[1575] 633.2.03-1.58 : 581.144.2
KENNEDY, W. K.; RUSSELL, M. B.
Relationship of top growth, root growth, and apparent specific gravity of the soil under different clipping treatments of a Kentucky bluegrass-white clover pasture. *J. Amer. Soc. Agron.* 40, 1948 (535-540). [Cornell Univ. Agric. Expt. Sta., Ithaca, N.Y.]

The amount of dry matter from roots, rhizomes and other plant residues in the surface soil varied from 6,960 lb./acre for areas which were not cut for 7 years to 4,180 lb./acre for areas cut at intervals of 1 week for 7 growing seasons. Variation was greatest in the top inch of soil. Plots with the greatest root and rhizome growth had the lowest apparent specific gravity. Infrequent grazing of a legume-grass mixture decreases the apparent specific gravity of heavy soils more than does frequent grazing of pasture.

[1576] 633.2.03-1.58 : 581.192
SCHOFIELD, J. L. **Mineral content and yield of grasses in the wet tropics as influenced by seasonal productivity, frequency of cutting and species.** *Queensland Dept. Agric. Bull.* 28, 1946, pp. 37.

In 19 grasses, the content and yield of lime and P varied considerably in different species grown on the same soil and under similar climatic conditions. Under monthly, 2-monthly and 3-monthly cutting there was during the first 12 months a negative correlation between lime content and rainfall and a positive correlation between P content and rainfall. The 4 lime-rich grasses included 2 varieties and one strain of *Panicum maximum*, and the 4 grasses with the highest P content included 2 varieties of the same species, which thrived on acid soils without fertilizer and with 3-monthly cutting. Grasses are listed which are suitable for pastures on

alluvial schist soils of tropical coastal Queensland. Some may be grown satisfactorily alone, but others must be grown in association with a legume.

[1577] 633.289 : 633.11
THOMAS, H. L.; MUMFORD, D. C. **The place of crested wheatgrass on wheat farms.** *Oreg. Agric. Expt. Sta. Bull.* 448, 1947, pp. 26.

Costs and returns showed that crested wheat grass is more profitable than wheat on gently sloping land, on slopes of 10-20% and on steep land, where yields of wheat are less than 8, 10 and 20 bu./acre respectively. Retirement of erodible land to crested wheat grass is recommended for the low-rainfall wheat region, and has shown an increased farm income resulting from a reduction in soil loss from erosion and from beef production. A long-term grass-wheat rotation on moderately sloping land yielding 13.5 bu./acre of wheat showed a decrease in income compared with continuous wheat.

[1578] 633.31-1.67
FERGUSON, W. G. **Irrigated lucerne in Queensland.** *Queensland Agric. J.* 65, 1947 (46-51).

Irrigation of lucerne in Queensland is confined to the southeast. Land should be well drained, deep, rich alluvial soil or clay loam well supplied with lime. Land should be first ploughed 6-7 inches deep several months before planting and again just before planting. Oats and potatoes are suitable crops to precede lucerne. A light irrigation is given immediately after sowing and levelling. If winter weeds become established the crop should be mown. Land should be renovated by harrowing lightly during the first year to aerate the soil. In succeeding years renovations become progressively deeper with stiff tine implements until in a 4-year-old stand a 3-inch renovation 3 times a year is necessary to open up the soil. The yield of hay is directly related to the volume of water available to the plant, but irrigation should be withheld during mid-winter to allow the soil to dry out and aerate. Irrigated lucerne may be grown for 5-10 years. Other crops including a ploughed-in green manure crop should follow for 5 years before resowing lucerne.

[1579] 633.31-1.811.5
WALLACE, A.; TOTH, S. J.; BEAR, F. E.
Influence of sodium on growth and composition of Ranger alfalfa. *Soil Sci.* 65, 1948 (477-486). [N.J. Agric. Expt. Sta.]

Lucerne was grown in sand cultures at different K levels with and without varying levels of Na. Changes in K and Na were compensated for by varying the Mg. Except in the case of those receiving 5 p.p.m. of K without Na all plants were of normal appearance, but yields increased with rising levels of K. Introduction of Na resulted in yield increases ranging from 3.3 to 73.6% but these varied with the K:Na ratio in the culture solution and did not occur when the K supply was high; also Na absorption at the highest K levels was small. Addition of Na did not change the cation-constancy values of the tissues but slightly depressed the absorption of Ca and Mg and increased that of K. Absorption of S was unaffected and that of P decreased by Na. Application of NaCl at 30 lb./acre of Na to lucerne plots failed to increase yields but the available-K content of the soil was considerably higher than that of the low-K nutrient solutions where response to Na was obtained.

[1580] 633.32-1.461.52-1.821.1
ANDERSON, A. J.; SPENCER, D. **Lime in relation to clover nodulation at sites on the Southern Tablelands of New South Wales.** *J. Aust. Inst. Agric. Sci.* 14, 1948 (39-41).

Defective nodulation was not improved by liming during the first year of the establishment of the plots, when the rainfall was particularly low during the spring. Lack of nodulation cannot, however, be attributed entirely to low-moisture conditions, since well nodulated plants occurred on neighbouring normal soils. The following year, when the spring rainfall was higher, all the plants on the limed plots were normal. In another trial, little benefit was obtained with lime or P applied alone, but in the presence of lime at the rate of 1 ton/acre the response to super. was very marked. Defective nodulation occurred usually on soils of the lowest pH, but well nodulated plants were found in soil of pH 4.6 and plants without nodules in soil of pH 5.4. In none of the experiments was nodulation induced by super., or by Mo, K, Cu, Zn, Mn, Fe, B or Mg.

Treatment with high levels of super. supplying up to 4 cwt./acre of gypsum did not improve nodulation; it therefore seems unlikely that defective nodulation is due to a simple deficiency of Ca.

[1581] 633.326:546.77
ANDERSON, A. J. **Molybdenum and other fertilizers in pasture development on the Southern Tablelands of New South Wales.** *J. Aust. Inst. Agric. Sci.* 14, 1948 (28-33).

Dressings of 2 oz./acre of molybdenum trioxide had a marked effect on the development and growth of subterranean clover. Probably dressings of 1 oz./acre would have been sufficient. The results of these trials suggest that the poor growth of subterranean clover was due to a deficiency of available Mo leading to N deficiency. Clear evidence is considered to have been provided in Australia that response to Mo by legumes may be entirely due to improved N fixation. Results of pot culture experiments (Anderson, A. J. and Thomas, M. P., *Aust. Counc. Sci. Indust. Res. Bull.* 198, 1946. See *Soils and Fertilizers* 10 (292)) which led to this conclusion are cited. Experiments to test the interaction of Mo and super. showed that responses to Mo occurred only where super. was applied.

[1582] 633.34-1.5
ARNOLD, H. C. **Soya Beans.** *Rhod. Agric. J.* 45, 1948 (147-168).

Soils and climatic conditions required by maize are best suited to soybeans. Well distributed summer rainfall of 25-30 inches is best. When rainfall was below average soybeans were less adversely affected than maize on adjoining land and the crop is less sensitive than maize on land that is not well drained. Shallow, waterlogged and acid soils are unsuitable. High humus content is important and in the absence of humus growth is often subnormal in spite of satisfactory bacteria nodulation of the roots. It is suggested that soybeans may require conditions suitable for the development of mycorrhiza on the roots in addition to nodule-forming bacteria. Compost, P and lime all have a beneficial effect, but K fertilizer is not required.

[1583] 633.34-1.811.9:581.192
 BEESON, K. C.; GRAY, L.; HAMNER, K. C.
The absorption of mineral elements by forage plants : II. The effect of fertilizer elements and liming materials on the content of mineral nutrients in soybean leaves. *J. Amer. Soc. Agron.* 40, 1948 (553-562). [U.S. Plant, Soil and Nutrition Lab., Ithaca, N.Y.]

Additions to the soil of Co, Mn, Cu and P increased the concentration of the respective element in the soybean plant. Large quantities of CaCO_3 did not affect significantly the absorption by the soybean of the Co naturally present in the soil, but absorption of water-soluble Co and of soluble Cu and Mn applied to the soil was greatly reduced by liming; absorption of naturally occurring Mn in the soil was also reduced by liming. Absorption of P and Fe were reduced slightly by liming. The Ca and Fe contents of soybean leaves were reduced 50% by high rates of application of N and P. Co, Cu and Mn contents were reduced by application of large quantities of P, but N did not affect the absorption of these elements. At low levels of N in the soil, application of P increased the P content of leaves, but at high levels of N there was no change in P content of the plant. At high levels of both P and lime there was no evidence of any toxic effect on yields because of micro-nutrient elements in the soil.

[1584] 633.377-1.5
 HIGBEE, E. C. **Lonchocarpus, derris, and pyrethrum cultivation and sources of supply.** *U.S.D.A. Misc. Pub.* 650, 1948, pp. 36.

Peruvian *Lonchocarpus* plantations are usually established in clearings in the rain forest that are prepared by flash burning, as lack of equipment, excessive leaching of the soils and the high cost of fertilizers make the use of old fields unprofitable. After burning, no further seedbed preparation is practised. *Lonchocarpus* reaches maturity in 3 years, and is interplanted with food crops during the first year.

In the Far East, *Derris* is grown as a cash crop on new rubber and kapok plantations. To facilitate harvesting the soil should be friable and the dry seasons not too prolonged. Experiments at Puerto Rico have shown that cuttings should be transplanted into pre-

viously ploughed and disced fields when rains are fairly frequent and fertilizer applied with the covering earth. The use of cane-trash mulch increased yields by 31.7% and tended to suppress weed growth.

In the cultivation of pyrethrum in the U.S., seedling stocks grown in outdoor seedbeds on well-drained, neutral, well-worked sandy loam are planted out in fields with good drainage. Thorough soil preparation, but not fertilizing, is essential. Pyrethrum tolerates summer heat and winter frost, and for maximum flower production a winter dormant period is necessary which may not be possible in the Tropics at less than 6500 ft.

[1585] 633.379-1.415.1
 LOUSTALOT, A. J.; TELFORD, E. A.
Physiological experiments with tropical kudzu. *J. Amer. Soc. Agron.* 40, 1948 (503-511). [P.R. Expt. Sta., Mayaguez]

Most of the upland soils on which tropical kudzu is grown in Porto Rico are acid, sometimes with a pH of 4.0. Kudzu grown on well drained clay soil made better growth than that grown on poorly drained soil. Plants in this soil unlimed grew better than those in limed soil, though under some field conditions applications of lime have been beneficial. Yield was increased when P was applied alone or with K, especially to poorly drained soils. B or K alone had no beneficial effect on kudzu grown on this soil type.

633.4 ROOT CROPS

[1586] 633.41-1.811.5
 SAYRE, C. B. **Correction of nutritional deficiencies of vegetable canning crops : the role of sodium as a nutrient for beets.** *N.Y. St. Agric. Expt. Sta. Rept.* 1947, 1948 (56-57).

500 lb./acre of NaCl stimulated the growth and increased the yield of beets. Na_2SO_4 and Na_2CO_3 also stimulated growth but Na_2SO_4 was costly and Na_2CO_3 was toxic when first applied. The possibility of substituting NaCl for part of the K in mixed fertilizers has been studied with soybeans and beets. 4 levels of K were applied to the soil and 4 levels of NaCl were substituted for $\frac{1}{4}$ of the K at each K level. With soybeans the substitution of Na for K did not increase yields. With beets NaCl

should be considered more as an important ingredient of the fertilizer mixture than as a substitute for part of the K. Largest yields of beet were obtained from seeding at 13 lb./acre on well fertilized soil to which 500 lb./acre of NaCl was added.

[1587] 633.426-2.191:546.27
HANSON, A. A.; COULSON, J. G.; RAYMOND, L. C. **Further studies on brown heart in swedes.** *Sci. Agric.* 28, 1948 (229-243). [Macdonald Coll. Quebec]

Rainfall is closely linked with some factor that tends to increase the prevalence of brown heart, as increase of rainfall increased the incidence of the disease; the disease decreased when the normal moisture supply was supplemented by irrigation and it seems that a constant supply of moisture might have a more favourable effect on the B status of the soil than has intermittent rainfall. For controlling brown heart, borax sprays applied to the foliage were superior to soil applications of dry borax.

When 250 lb./acre of muriate of potash was applied to the soil in bands on either side of the seed, B-deficiency increased, but not significantly. Little disease developed in plots receiving K and a spray of borax, but when 25 lb. of dry borax was added with the K to the soil, brown heart disease increased 8.5%.

[1588] 633.491-2.4-1.5
AFANASIEV, M. M.; MORRIS, H. E. **Time of infection and accumulative effect of *Rhizoctonia* on successive crops of potatoes.** *Amer. Potato J.* 25, 1948 (17-23). [Mont. Agric. Expt. Sta.]

Tubers, stems and stolons of the potato are very susceptible to attack by *Rhizoctonia solani* which can become an economic factor within one or two years of even slight initial infection. Cultural practices such as planting resistant crops and growing potatoes only once in several years prevent accumulation of *Rhizoctonia* in the soil.

633.5 FIBRE PLANTS

[1589] 633.51-1.432.2:581.192
EATON, F. M.; EGGLE, D. R. **Carbohydrate accumulation in the cotton plant at low moisture levels.** *Plant Physiol.* 23, 1948 (169-187). [Texas Agric. Expt. Sta.]

The cotton plant possesses an ability to survive long and intense drought and to recover with the loss of comparatively few leaves when water is again supplied. In cotton leaves drought increased hexose sugars, reduced starch concentrations and had variable effects on sucrose. In stems and roots drought always caused moderate to large increases in concentrations of hexoses, sucrose and starch. On the basis of averages of stems, leaves and large roots the concentrations for the plant as a whole were doubled by protracted drought, which appears to depress carbohydrate utilization by the plant to a greater extent than it does photosynthesis. Drought caused both increase and decrease in hemicellulose concentrations in leaves, according to conditions of growth, but caused no significant differences in stem and root tissues. The carbohydrate concentration differentials between leaves and stems were greater in plants on dry than on moist soils. In summers with enough rainfall to prevent evident or frequent wilting, irrigation increased growth substantially.

[1590] 633.51-1.547.1-1.415.3
STROGOV, B. P. **Germination of cottonseed collected from saline soil.** *C.R. Acad. Sci. U.R.S.S.* 54, 1946 (645-647). B.A. BIII (129).

Cottonseed from saline soils may contain specific substances which inhibit germination and seedling growth, the substances being readily removed by soaking the seeds in running tap water for several days.

[1591] 633.51-2.953
SMITH, A. L. **Soil treatment control of *Fusarium* wilt and nematodes of cotton.** *Phytopath.* 38, 1948 (573).

Control of wilt and nematodes was almost complete after the application of 30-37 gallons/acre of ethylene dibromide (10% by volume).

[1592] 633.52-1.415.1
SAJDEL, A. **Wpływ kwasowości gleby na rozwój lnu. [Effect of soil reaction on the growth of flax.]** *Rocz. Nauk Roln.* 50, 1948 (271-284). [Pl. f.]

Pot experiments were made in sandy soil, originally of pH 5.0, that was adjusted to pH 3.6, 4.3, 5.8 and 6.3. Yields of straw and grain were highest in the less acid soils, but

the mass of root was greatest in the more acid soils. Percentage of oil in seeds was constant, but yield of oil was smaller the higher the acidity. The technical qualities of the fibre (yield, length and diameter) were better at pH 6.3 and 5.8 than under more acid conditions. It is suggested that a weakly acid reaction is desirable.—R.N.

[1593] 633.52-1.5
CLYDESDALE, C. S.; BURNS, S. G. **Linseed growing.** *Queensland Agric. J.* 66, 1948 (133-137).

Linseed may be used in the normal crop rotation and machinery used for wheat may with slight modification be used for linseed. With certain varieties a good quality crop may be grown in hot regions even with poor rainfall distribution, provided the seed bed is well prepared. Almost any soil that shows no tendency to water-logging and is not sheltered or in a hollow is suitable for linseed. The best soils are well drained dark to chocolate loams, rich in organic matter. High atmospheric humidity in sheltered hollows encourages rust. Linseed is also susceptible to wilt and other soil-borne fungus diseases. Seed treatment with organic mercury dusts may help to control these diseases but linseed should not be grown on the same land 2 years in succession.

[1594] 633.526.22-1.4
FOREIGN AGRICULTURE. **Henequen.** *Foreign Agric.* 12, 1948 (158).

Henequen, the fibre of *Agave fourcroydes* has, since 1941, become a major crop in El Salvador. It grows best in an arid sunny climate on well drained soils. In Yucatan most plantations are on porous limestone and in Cuba rocky soil unfit for sugar cane is used for henequen.

633.6 SUGAR CROPS

(See also Abs. Nos. 1552, 1688, 1689)

[1595] 633.61-1.3
SOUTH AFRICAN SUGAR ASSOCIATION. **Mechanisation of the sugar farm.** *S. Afric. Sug. J. Rept.* 1, 1948, Suppl., pp.18.

Report of a field demonstration of various implements of cultivation and fertilizer distribution and of machinery for cutting and planting.

[1596] 633.61-1.427.3
KNOWLES, W. H. C., ET AL. **Informal discussion No. 4/47: "The position as regards the use of the Holme Maize Microplot Technique for determining manurial requirements of sugar cane throughout the Caribbean area."** *Proc. Meetg. B.W.I. Sug. Tech.* 1947 (75-78).

[1597] 633.61-1.427.3
THOMPSON, H. A. **Preliminary notes on a corn pot test as an aid in assessing the fertilizer requirements of sugar cane soils.** *Proc. Meetg. B.W.I. Sug. Tech.* 1947 (69-74). [W.I. Sug. Co. Monymusk]

A pot-test technique to replace or augment the corn-microplot technique was tried. Statistical analysis showed that the tests were reasonably accurate. Maize was chosen as the indicator plant, cane itself was also used and a "fixed" strain of Sudan grass is now being tried. Under the conditions of the test maize was much more sensitive to P deficiency than either cane or Sudan grass. Responses of considerable magnitude were obtained for N and P. The nature of the responses varied greatly with the soil type. The K responses were insignificant. Placement was important; when P was placed in the soil about 1½ inches from the surface there was a remarkable response to high P application.

[1598] 633.61-1.84: 581.192
BORDEN, R. J. **Nitrogen effects upon the yield and composition of sugar cane.** *Hawaii. Plant. Rec.* 52, 1948 (1-51).

N at 0,100,160 and 220 lb./acre was applied in 2-4 dressings spread over the first 11 months. The higher amounts produced denser stalk population, higher mortality of primaries, greater incidence of suckers, less tasseling, heavier tonnages of green tops, increase in moisture content and reducing-sugar concentration, especially in the first year's growth, lower concentration of sucrose in total dry weight in the first year, but the reverse in the second year, and higher concentration of "total" sugars in dry weight after 15 months. The higher applications of N also decreased the ratio total sugars: N in the total dry weight, had little or no effect on the ratio total sugars: total dry weight or the ratio millable cane: total green weight harvested. An increase in the N concentration of all plant parts studied occurred

within 4 weeks of increasing the N applications. Deficiency levels of N for this variety at 11 months were 1.28% N in the leaf-punch samples and .0226% amino-N in the elongating cane. The primary index (% total sugars in leaf sheaths) showed a positive relationship between total sugars and moisture in the leaf sheaths and the N in the leaf-punch samples.

67% of the maximum yield of millable cane was "in the field" at 12 months. Late N applications were relatively ineffective at the smaller rates, but with the larger total applications, a late dressing at 11 months gave better yields.

[1599] 633.61-2.951
BUZACOTT, J. H. The use of benzene hexachloride in North Queensland cane-fields. *J. Aust. Inst. Agric. Sci.* 14, 1948 (24-27).

Benzene hexachloride gives very effective control of the white grub (*Dermolepida albobirtum* Waterh.). Extensive tests showed that, when applied in contact with cane setts, even at comparatively small rates per acre, benzene hexachloride had no observable effect on the growth of the shoots and buds but inhibited the production of both primary and secondary roots. As more than 40 lb./acre of crude benzene hexachloride are needed to cause noticeable depression of growth when the insecticide is mixed with the soil, and only 10 lb./acre or less of benzene hexachloride containing 13% γ isomer is needed to control the grub, there is not much likelihood of damage to the plant so long as the insecticide is not applied directly to the cane setts. No. 10 "Gam-mexane" dust, which is a 10% mixture of crude benzene hexachloride with pyrophyllite and contains 1.3% γ isomer, is recommended at the rate of 100 lb./acre for the control of white grub in cane fields. Dosages of 75 lb./acre have also proved effective in some instances, and even 50 lb./acre may be of use on the heavier soils. For plant cane the dust should be applied to the surface of the soil over a band 15 to 18 inches wide along the drills after the cane has germinated and become well established. For the ratoon crop it is suggested that furrows be opened each side of the rows and then closed after the dust has been applied.

[1600] 633.61-2.954: 577.17
NOLLA, J. A. B. The control of grass weeds in sugar-cane fields in Puerto Rico. *Science* 108, 1948 (112-113).

Grass weeds have become the worst competitors of sugar cane for soil nutrients and soil moisture. The grass-weed population increased when broad-leaved plants were destroyed by 2,4-D or other herbicides. Effective control was obtained with 150 ml. of 40% 2,4-D ester per gallon of diesel oil at the rate of 40-50 gallons/acre. Other very effective treatments at the same rate per acre were: (a) dinitro-*o*-secondary butyl phenol (commercial Dow Contact) in combination with 2,4-D and diesel oil (1 gallon of Dow Contact + 500 ml. of 40% 2,4-D ester to 10 gallons of diesel oil) and (b) 1 lb. of pentachlorophenol + 1 l. of 40% 2,4-D ester to 15 gallons of oil. Firing to destroy all above-ground parts of a grass weed stand was ineffective; *Cyperus rotundus* and certain other plants were rather stimulated than otherwise. Thus, 2,4-D becomes a very active grass herbicide when dissolved in diesel or aromatic oil and applied as a fine spray. It has, however, to be used with extreme care in sugar-cane plantations, as much injury may be caused to leaves of sugar cane, particularly on a windy day. Two alternative methods of application have been developed. One involves preplanting application, the 2,4-D oil spray being applied to grass weeds that have been allowed to grow for 3 weeks following preparation of the fields and the application of irrigation water. The second method consists of applying the 2,4-D spray when the cane is over 3 months old. A combination of the two methods has effectively reduced the number of hoeings from 6 or 7 to 3 in new plantings.

[1601] 633.63-1.811.91
PANELLA, A. Water consumption of sugar beets in various stages of development. *Indust. Saccar. Ital.* 41, 1948 (15-20). C.A. 42 (4773).

Pot experiments showed that when the soil was kept fully saturated with moisture production was at the rate of 14.2 tons/ha. of dry substance and 6 tons/ha. of sugar. When the soil was kept only 60% saturated production was 14.1 tons/ha. of dry substance and 6.5 tons/ha. of sugar.

[1602] 633.63-1.84-1.816.23
FARMING. **Top dressing of sugar beet.**
Farming 2, 1948 (153).

When beet is drilled without the application of artificial manures, top dressings of 1 cwt./acre of nitro chalk or NaNO_3 should be applied just after the crop has been singled. Even with normal manuring before drilling, the application of N top dressings just after singling encourages the plants to grow away quickly from weeds.

[1603] 633.63-1.874
STUMPEL, J. M. H.; VERBURGT, J. W. Groenbemestingsproefvelden te Kruisland en Dinteloord in 1943. [Green-manuring trial fields at Kruisland and Dinteloord in 1943.] *Meded. Inst. Ration. Suikerprod.* 16, 1946, 1948 (221-234). [Du.e.f.]

Each field, on which beets were to be grown, was divided into 3 plots to each of which (1) 80 kg./ha. and (2) 120 kg./ha. of N as $\text{Ca}(\text{NO}_3)_2$ was applied and (3) 80 kg./ha. of N as $\text{Ca}(\text{NO}_3)_2$ was applied to vetch grown for green manure. Yields were not increased significantly by the vetch.

[1604] 633.63-2.112.
LEMOYNE, S.; BELVAL, H. Résistance des betteraves à l'action du froid. [Resistance of beetroots to cold.] *Indust. Agric. Aliment.* 65, 1948 (83-87). [F.g.e.i.]

Early, light autumn frosts do not affect beetroots. The fatal temperature is -6° to -10°C .

633.7 STIMULANTS (See also Abs. Nos. 1679, 1685, 1702)

[1605] 633.71-1.86/7
McEvoy, E. T. **The organic matter of tobacco soils.** *Lighter* 18, 1948 (17-20).

In the two-year rye-tobacco rotation on flue-cured tobacco farms organic matter is supplied by discing-in the rye in the autumn. Longer rotations and additional conservation are required, however, to provide for the adequate maintenance of organic matter. In addition to discing-in rye in the autumn and ploughing-under a rye cover crop in the spring an annual application of five tons of manure per acre increases yields.

With burley tobacco three- or four-year rotations and heavy applications of manure produce better yields than continuous tobacco.

[1606] 633.71-2.51
SCOTT, W. A. **Preliminary results on chemical weed and disease control in tobacco plant beds.** *Lighter* 18, 1948 (10-15).

These experiments were designed to devise a method to suit Ontario practices, where seedlings are grown under artificial conditions in glass- or cotton-covered beds usually prepared in spring. Prospects for the successful use of uramon and calcium cyanamide for weed and black root-rot control are good, although pending the completion of the experiments chemical methods must be used with caution.

[1607] 633.71-2.7-2.951
MOFFETT, A. A. **The use of Gammexane for the control of white grubs and wireworms in tobacco lands.** *Rhod. Agric. J.* 45, 1948 (132-146). [Tobacco Res. Sta., Trelawney, S. Rhodesia]

300 lb./acre of Gammexane, ranging from 0.50 to 0.04% broadcast or applied as local dressings immediately before or several weeks before planting, killed white grubs and false wireworms. The higher concentrations gave a higher degree of control, but are too expensive for commercial use. Hills where plants are missing should be treated with Gammexane before refilling. Gammexane applied in 1946-47 had a residual effect in 1947-48.

[1608] 633.71-2.765-1.584
GREENWOOD, D. E. **The influence of cover crops on wireworm injury to tobacco.** *Conn. Agric. Expt. Sta. Bull.* 493, 1946 (14-16). R.A.E. 36A (183).

Wireworm injury to newly set tobacco plants is reduced when rye is used as a winter cover crop; the wireworms feed on the rye before and for a week or two after it is ploughed in and so complete their spring feeding without attacking the tobacco plants. A cover crop of oats is unsuitable as it is killed by winter cold. It is emphasized that as the success of this method is in no way related to a reduction in wireworm population, the procedure must be carried out each year and the stand of rye must be adequate.

[1609] 633.79-1.81
THOMAS, P. H. **The Tasmanian hop industry.** *Tasm. J. Agric.* 19, 1948 (79-87).

Leguminous cover crops should be sown in January or February and ploughed under in September. Waste hop vines should be composted and returned to the soil. 10-15 cwt./acre of blood and bone and 2 cwt. of muriate of potash are usually applied as a basal dressing with 2 or 3 light dressings of $(\text{NH}_4)_2\text{SO}_4$ or NaNO_3 during the growing period.

633.8 AROMATIC AND OIL PLANTS

(See also Abs. Nos. 1584, 1704)

[1610] 633.821-1.5
CHILDERS, N. F.; CIBES, H. R. **Vanilla culture in Puerto Rico.** *P. R. Fed. Expt. Sta. Circ.* 28, 1948, pp. 94.

Vanilla grows best when the annual rainfall is about 75 inches or more and fairly well distributed throughout the year. On level land it thrives on well drained gravelly or sandy loam rich in humus, but on heavier soils which tend to waterlog on the level it should be grown on the lower slopes of hills where the subsoil is well drained. The best vanilla soils in Puerto Rico are of limestone origin with a pH of 6.0-7.0. The plant should be mulched to a depth of 10-15 inches with grass and legumes grown for the purpose.

[1611] 633.822-1.5
SIEVERS, A. F.; STEVENSON, E. S. **Mint farming.** *U.S.D.A. Farm. Bull.* 1988, 1948, pp. 30.

Recommendations on soil requirements and preparation, fertilizers, irrigation, cultivation, diseases and pests are given.

634. ORCHARDS. FRUIT

(See also Abs. Nos. 1520, 1680, 1705)

[1612] 634-1.5
FARMER'S WEEKLY. **Three-year preparation for orchard soils.** *Farm. Week. S. Africa* 85, July 28, 1948 (105).

Land for orchards should be cultivated to loosen the soil to a depth of 3 feet to ensure good root penetration. Impervious layers can be broken up satisfactorily by deep cultivation, trenching or subsoiling. The land should be drained so that the water

table does not rise to within 3 feet of the surface and irrigation water should penetrate to 3 feet. Fertilizers with high N content should be applied and lupins fertilized with 400 lb./morgen of raw phosphates should be grown in winter and ploughed-in in August. These should be followed by sunnhemp grown during the summer.

[1613] 634.11-1.81-1.5
DAVIS, M. B.; HILL, H. **Orchard soil management and apple nutrition in Eastern Canada.** *Canada Dept. Agric. Pub.* 802, *Tech. Bull.* 65, 1948, pp. 28.

Symptoms useful in diagnosing deficiencies and excesses of individual elements are described by means of coloured plates, and illustrations and corrective measures are given. Certain general fertilizer recommendations are made. N, being an effective growth-regulating factor, should be applied separately from the minerals. On alkaline soils a N fertilizer with a residual acid reaction such as $(\text{NH}_4)_2\text{SO}_4$ should be used. N should be eliminated from the fertilizer programme for at least a year where leaf scorch due to K deficiency is present. When farmyard manure is available it may be used at the rate of 6 to 7 tons/acre to the tree area and this amount should provide the equivalent of 700 to 800 lb. of 9-5-7, but it may be necessary to supplement the manure with a quickly available N fertilizer in the spring as the N in manure is rendered available rather slowly.

[1614] 634.11-2.191-1.811.6
HILL, H.; JOHNSTON, F. B. **Magnesium-deficiency control in Quebec apple orchards.** *Int. Cong. Pure Appl. Chem.* 11, 1947. B.A. BIII (129).

Full response to broadcast applications of Epsom salts on sod orchards may be delayed for 2-3 years. Four cover sprays of 2% MgSO_4 solution corrected Mg deficiency in the first year and the treatment is recommended as a temporary control measure. The delayed results would probably follow broadcast applications of dolomitic limestone on sod orchards.

[1615] 634.25-1.584-1.84
McHATTON, T. H. ET AL. **The response of peach trees to nitrogen and cover crops.** *Ga. Univ. Bull.* 47, 1946, pp. 15. *Biol. Abs.* 22 (423).

Yields were increased by applying quickly available N, half in March and half in September. The date of incorporation of cover crops made no significant difference to yields. Yields were lowest from trees under continuous cover.

[1616] 634-3-2.4
RUGGIERI, G. Fattori che condizionano o contribuiscono allo sviluppo del "mal secco" degli agrumi e metodi di lotta contro il medesimo. [Factors inducing, or contributing to, the spread of *mal secco* and methods of control.] *Ann. Sper. Agrar. Roma* 2 (n.s.), 1948 (255-305). [I.e.] [Sta. Pat. Veg., Rome]

This disease of Mediterranean citrus fruits (especially lemons) is due to *Deuterophoma tracheiphila* Petri. It was first observed on lime-deficient alluvial soils in Sicily, but later observation has not brought out any correlation between soil type and incidence of the disease. There is no clear correlation with manurial or cultivation practices, though unbalanced nitrogenous manuring in the forced production of *verdelli* lemons probably renders trees unduly susceptible. Fungicides and soil amendments such as Mn salts have had no consistent value. The only cure is surgical, and it is suggested that the problem therefore is one of making the growers aware of the effectiveness of tree surgery. Resistant varieties and species, grafting and other aspects are discussed. —R.N.

[1617] 634-441-1.5
MARLOTH, R. H. The mango in South Africa. *S. Africa Dept. Agric. Bull.* 282, 1947, pp. 27.

The mango requires a cool winter and hot summer with a small daily range of temperature and an annual rainfall of 30-40 inches. Rain or dew during the fruit-ripening period results in loss of fruit. Soil type is not a limiting factor, but a deep loam is best. The soil should be well drained.

[1618] 634-521-1.5
BILLINGS, I. K. Pecan industry in the United States. *Ec n. Geog.* 22, 1946 (220-227).

An account is given of the type of land chosen for pecans, methods of planting,

diseases and varieties. Pecan trees require rich fertile soil and should not be planted too close together; 9, 6 or 4 trees per acre are suggested. In most areas where pecan trees are indigenous soil fertility is maintained by silts and muds deposited by periodic overflow of adjacent streams. Where no fertilizing muds and silts are available commercial fertilizers and cover crops are used.

[1619] 634-58-1.81
MASSIBOT, J. A.; VIDAL, R. Expérimentation préliminaire de la fumure des terres à arachide de la région de Louga (Sénégal). [Preliminary experiments with the manuring of groundnut soils in the Louga region (Senegal).] *Agron. Trop.* 2, 1947 (247-278). [F.]

These experiments were laid out according to the method of blocks with four replications, using NPK, PK, NP, NK and an unmanured control plot. Details of the statistical analyses and interpretation of the experimental results are discussed. It is concluded that these soils need P for both millet and groundnut. N had a marked effect on sorghum, but practically none on groundnuts, while K had either no or scarcely any effect.

[1620] 634-61-1.81
SALGADO, M. L. M. Notes on the manuring of coconut palms. *Trop. Agricst.* 103, 1947 (113-120). [Coconut Res. Sch., Ceylon]

K was found to be the principal requirement of coconut palms on a good soil. N gave a maximum increase of 8%, K giving increases of 25-39% on the same soil. On a poor lateritic gravel P appeared to be the limiting factor. For bearing coconut palms excess N should be avoided, an application of 0.5 lb. of N per palm being considered sufficient. Where large amounts of P have been used application of phosphates may be omitted for 4 to 6 years. Where no manuring has been done for 4 or 5 years, particularly in lateritic and gravelly soils, an application of 0.6 lb. of P_2O_5 per palm would be suitable. K_2O at the rate of 1-1.5 lb. per palm would be sufficient, the larger amount being applicable to K-deficient soils. Under cover crops a complete NPK fertilizer is the most satisfactory. Manures are

usually applied in circular or "long-line" trenches. Broadcasting can only be recommended on flat lands, with soils of open texture. Manures should be applied during the S.-W. and N.-E. monsoons after the heavy showers are over. It is preferable to apply half the amount of K annually rather than the full dose once in two years. Selective manuring of backward palms is recommended. Ploughing should either immediately precede or follow manuring.

[1621] 634.61-1.81
SALGADO, M. L. M. Recent studies on the manuring of coconuts in Ceylon. *Coconut Res. Scheme (Ceylon) Bull.* 6, pp. 26.

Early manurial experiments beginning in 1912 are mentioned. The first modern field experiment on the manuring of coconuts was begun in 1934. The $3 \times 3 \times 3$ or a similar factorial design is stated to be more satisfactory for experiments on coconuts than randomized blocks or Latin squares. The results of manurial experiments on coconuts on good and on poor soils and on the influence of manuring on copra output and on setting of nuts are summarized. The results of an experiment on cover crops, their utilization and manuring are summarized and discussed. Experiments in other countries are said to be of little value as the soil and climatic conditions in Ceylon differ from those elsewhere.

[1622] 634.61-1.821.1-1.823
SALGADO, M. L. M. The use of lime and salt for manuring coconut palms. *Trop. Agricst.* 103, 1947 (121-123). [Coconut Res. Sch. Ceylon]

As no experimental evidence is available the author bases his opinion on the known chemical and physical effects of lime and salt on the soil, and considers that they cannot be recommended as manure for coconuts and that money can be better spent on other essential manures whose beneficial effects have been proved beyond doubt.

[1623] 634.715-1.5
DARROW, G. M.; WALDO, G. F. Growing erect and trailing blackberries. *U.S.D.A. Farm. Bull.* 1995, 1948, pp. 34.

The best blackberry land is deep fine sandy loam, high in humus and with sufficient

soil moisture. The soil should be ploughed 9 inches deep in spring and the field harrowed before planting. 20 tons/acre per year of stable manure is recommended as fertilizer or 600-1000 lb. of 4-8-4 should be applied. Leguminous and other cover crops should be ploughed under before planting and grown between the rows each year.

[1624] 634.75-2.4-1.461:581.144.2
KATZNELSON, H.; RICHARDSON, L. T. Rhizosphere studies and associated microbiological phenomena in relation to strawberry root rot. *Sci. Agric.* 28, 1948 (293-308). [Dept. Agric., Ottawa]

When soil infested with strawberry root rot was treated with dried blood, acetic acid and by steam sterilization the disease was reduced. The addition of oat straw increased the severity of the disease. Infected discoloured roots were associated with *Rhizoctonia solani*, *Cylindrocarpon*, *Cylindrocladium* and *Pythium*, and results of experiments suggest that fungi are the most important pathogens. Inoculation of sterilized soil with saprophytic and pathogenic fungi and certain groups of bacteria indicated that *Rhizoctonia solani* was the most serious of the pathogens used. It was isolated in 90% of the trials. Bacteria did not seem to influence the development of root rot though they may be secondary invaders.

The marked rhizosphere effect exerted by roots on organisms was affected by the soil treatments. Dried blood seemed to stimulate plant growth, resulting in more vigorous excretion and consequent increase in rhizosphere population. When soil was treated with acetic acid the rhizosphere effect was diminished and the ratio of rhizosphere:soil fungi was depressed. Most of the treatments also reduced the ratios of rhizosphere:soil bacteria.

Organisms requiring complex nutritional factors were relatively more abundant in the soil than in the rhizosphere. Bacteria with simple nutritional needs and those requiring amino acids for growth were more numerous in the rhizosphere than in the adjacent soil. Qualitative differences between the fungus flora of the soil and that of the rhizosphere and also a change in the flora of the rhizosphere with time were also observed.

[1625] 634.8-1.5
IOWA AGRICULTURAL EXPERIMENT STATION.
Growing grapes in Iowa. *Iowa Agric. Expt. Sta. Bull.* P90, 1948 (987-1000).

Fairly light, well-drained soils with an E., S.E. or S. exposure are most suitable for grapes. They should be clean cultivated during the early part of the growing season while a cover crop of oats, rye or buckwheat planted in July or August provides winter protection and encourages early ripening of the wood. A heavy straw mulch may replace clean cultivation. Incorporation of organic matter into the soil is beneficial but excessive use of N promotes wood growth at the expense of fruitfulness.

[1626] 634.8-1.81
SHAULIS, N. **The effect of certain commercial fertilizers upon the growth, production, and quality of grapes.** *N.Y. St. Agric. Expt. Sta. Rept.* 1947, 1948 (41).

Application of 64 lb. of N was profitable on vineyards with thin soil, but where the soil is deeper spring applications of N were less effective and 2½ tons/acre of waste hay applied each year increased yields. There was no benefit from applying part of the N in spring and part at blossoming time. Applications of K or P and K with the N had no effect on vine growth or yield.

634.9 FORESTRY

(See also Abs. Nos. 1401, 1693)

[1627] 634.9:551.58
AUBREVILLE, A. **Observations d'écologie générale. [General ecological observations.]** *Agron. Trop.* 2, 1947 (592-613). [F.]

Measurements of the vapour pressure and saturation deficit in French Equatorial Africa showed that with the onset of the dry season the reserves of water in the soil in the regions situated to the north of the Cameroon and Congo equatorial forests were rapidly exhausted. Southerly winds however, emanating from humid and cooler forest regions bring with them water vapour and thus considerably diminish the aridity of the dry season. This confirms the author's opinion that extensive forests exert a climatic influence over long distances.

[1628] 634.9-1.61
BURGER, H. **Bodenverbesserungsversuche. III. Versuche im Gemeindewald von Langenthal und im bernischen Staatswald Biglenwald. [Soil-improvement experiments. III. Experiments in the common forests of Langenthal and in the Bernese state forests of Biglenwald.]** *Mitt. Schweiz. Anst. Forstl. Versuchsw.* 24, 1946 (517-579). *Biol. Abs.* 22 (427). [G.]

Slight deterioration in the physical condition of forest soil may be overcome by superficial cultivation, mulching with twigs, application of ashes and lime and inoculation with healthy forest soil. Where peat has begun to form, drainage alone has no effect, but when combined in the Langenthal forest with removal and burning of raw humus and moss, scattering of the ashes and 5-10 tons/ha. of ground limestone and the planting of suitable broadleaved species, conditions improved within 18 years. In the Biglenwald forest application of 10 tons/ha. of lime decreased acidity of the upper layers but the scattering of ashes without lime had only a slight effect after 16 years. Inoculation with healthy top soil together with burning increased the number of herbage species temporarily. Species should be planted that will cover the ground quickly and produce leaf litter that decomposes readily so as to check growth of undesirable mosses and heather.

[1629] 634.9-1.822:552.323.5
NĚMEC, A. **Meliorace degradovaných a ochuzených lesních půd pomocí hornin-basických vyvřelin. [Improvement of degraded poor forest soils with the help of crushed basic eruptive rocks.]** *Čsl. Les.* 26, 1947 (280-284). *Biol. Abs.* 22 (429). [Cz.]

On unproductive degraded forest soils including podzols with hardpan layers, spruce trees 25 years old were only 16.5 inches tall and the average annual height growth was 0.65 inch; hardwoods died soon after being planted. After removing the soil cover of *Calluna vulgaris* and *Vaccinium myrtillus*, crushed basalt and diabase were added in layers ½-1 inch thick. After 2 years the average annual height increase was 17.5 inches.

[1630] 634.953.6
PRESTON, R. J., JR.; BRANDON, J. F. **37 years of windbreak planting at Akron, Colorado.** *Colo. Agric. Expt. Sta. Bull.* 492, 1946, pp. 25.

Experimental tree plantings were made in the years 1909, 1910, 1912, 1935 and 1936 in a treeless area with a native vegetation of grasses. Precipitation was highly variable and averaged 16.9 inches over a 37-year period, and it was necessary to fallow the land for at least one year in order to store adequate moisture before planting and to cultivate intensively during the first 3-5 years to protect the young trees from competing vegetation. A spacing of 10-12 feet between rows facilitates cultivation while close spacing within the marginal rows reduces wind penetration. Of the 29 species investigated ponderosa pine was the most effective and durable under N.E. Colorado conditions.

[1631] 634.972.5-1.417.2
DUCHAUFOR, P. Le hêtre est-il une essence améliorante? [Is beech an ameliorating species?] *Rev. Eaux et Forêts* 85, 1947 (729-737). [F.]

Beech produces a mild humus and has a favourable effect on calcareous soils, and on non-calcareous soils provided they are only weakly acid and the climatic conditions are optimal. Under very humid, mountainous conditions and on soils already acid beech accentuates the soil acidity. Beech may thus be described as a good preventive but a bad cure of soil acidity. It is recommended as an understorey in oak forests on slightly leached soil; beech litter contains more Ca than oak litter. It should not be used as an understorey in coniferous forests, as these usually occur on already strongly leached soils, and under these conditions beech leaves decompose too slowly to improve the state of the humus. Alder is suggested as an alternative, and possibly also *Robinia*.

[1632] 634.975-1.459
AIKMAN, J. M. Response of pine seedlings to site selection on eroded soils. *Proc. Iowa Acad. Sci.* 52, 1945 (77-82). *Biol. Abs.* 22 (958).

Growth response was greatest in loam with no top soil where there was little or no competition from weeds and grasses. In other plots, competition with bluegrass was a critical factor in the establishment and growth of pines. Small plantings of pines are suggested as an aid to the holding and building of soil in erosion problem areas.

[1633] 634.975-1.466.1
CHASTUKHIN, V. YA. [An ecological analysis of the decomposition of plant residues in young pine plantations.] *Pochvovedenie* 1948 (87-99). [R.]

In plantations established on burnt-out forest sites the microflora during the early stages of growth (up to four years) was partly influenced by the previous forest growth and partly by the new plantation. The pioneer of the new microflora was *Boletus luteus* L. After the canopy had closed and up to 20 years the principal species were *Boletus luteus* L., *Lachartus rufus* Fr. and *Telephora terrestris* Chrh. At 50 years the microflora became more varied and included *Amanita muscaria* Pers., *Boletus variegatus* Swartz., *B. bovinus* L. and *Boletus edulis* (Bull.) Fries. Immediately after a fire the soil becomes particularly rich in mineral salts and *Laccaria laccata* Scop. was found to be established in large numbers, developing apparently on the final products of the decomposition of organic materials. On a number of dead trees left standing after a fire the principal fungi taking part in the decomposition of the dead wood belonged to the Polyporaceae and to the Agaricineae. Tree stumps and roots were also decomposed by *Trametes squalens* Karst, *Polystictus abietinus* Fr., *Armillaria mellea* Karst, and *Tricholoma rutilans* Quélet. Various insect larvae were also of considerable importance in the decomposition of pine stumps.

[1634] 634.975-1.472:581.144.2
DANILOV, M. D. [Root distribution in the soil horizons of cleared forest land and burnt forest land of pine plantations.] *Pochvovedenie* 1947 (724-729). [R.]

In dry concealed podzolized soil of burnt forest land which had not been replanted most of the roots were in horizons B_1+B_2 followed by horizon A_2 . In the same soil, but under a young pine plantation, root distribution was considerably altered, most of the roots being in horizons A_1 and A_2 . In pine plantations most of the roots were found in the humus horizon.

[1635] 634.975-2.191-1.811.1
ROTH, E.R.; TOOLE, E.R.; HEPTING, G. H. Nutritional aspects of the littleleaf disease of pine. *J. Forestry* 46, 1948 (578-587).

Littleleaf disease affects shortleaf and to a lesser degree loblolly pine. Diseased shortleaf pines show a marked deficiency of N and Ca in the foliage and a somewhat lower content of Mn, Al and Cu than healthy trees. Only soil amendments containing large quantities of inorganic N were effective against littleleaf. NO_3^- or NH_4^+ -N at rates exceeding 200 lb. of available N per acre reduced the incidence of littleleaf among healthy trees and improved the condition of diseased trees. Salts of 14 other elements or their combinations and also organic matter in different forms had little effect. Littleleaf seems to be connected with the failure of the trees to absorb sufficient N even when it is present in the soil in adequate amounts.

[1636] 634.989.84-1.461.1/3
BOUDRU, M. A propos de certaines propriétés des feuilles et aiguilles mûres de nos arbres forestiers en liaison avec leur pouvoir améliorant. [Certain properties of mature leaves and needles of our forest trees in relation to their power as soil improvers.] *Bull. Soc. For. Belg.* 54, 1947 (129-162). *For. Abs.* 9 (415). [F.]

The speed of decomposition of leaves and needles of forest trees depends on the species as well as on the environment. Particular emphasis is laid on the extremely rapid decomposition of the leaves of elms, ash and alders, the inferiority of beeches in this respect and the superiority of oak to beech on biologically inactive soils.

635 HORTICULTURE

(See also Abs. Nos. 1465, 1531)

[1637] 635.263-2.4
TIMS, E. C. White rot of shallot and its control. *Phytopath.* 37, 1947 (437).

Soils in shallot-growing areas in southern Louisiana were heavily infested with *Sclerotium cepivorum* Berk. which caused severe injury to shallots in the winter months. Lime, applied to change the pH of the soil from 5.6 to 7, reduced but did not prevent infection. 1 oz. of Semesan per gallon of water and HgCl_2 (1:500) applied to the soil around the roots at the rate of 80 c.c. per plant gave almost complete control.

[1638] 635.41-1.81:581.192
NILSSON, F. Gödslingsförsök i fröodling av spenat och kryddkrasse. [Experiments with fertilizers for spinach and cress grown for seed.] *Årsskr. Alnarps Lantbr. Inst.* 1947 (11-25). [Sw.e.]

In experiments during the years 1942-45, 0, 200 and 400 kg./ha. of $\text{Ca}(\text{NO}_3)_2$, super. and K_2O were applied to spinach and cress. N increased the seed crop, the greatest increase being from 400 kg. of $\text{Ca}(\text{NO}_3)_2$; super. and K had little effect on seed production whether applied separately or together. On cress the effect of N was greater if super. was applied at the same time. The influence of fertilizers on seed quality was small.

[1639] 635.52-1.5
BROWN, W.; MONTGOMERY, N. Problems in the cultivation of winter lettuce. *Ann. Appl. Biol.* 35, 1948 (161-180). [Imp. Coll. Sci. Tech., London]

Late autumn plantings of winter lettuce survived better on a medium-heavy loam than on a light sandy soil. Mulching produced white roots and stronger, healthier plants, probably by protecting the root system from frost. Soiling-up of the leaf bases encourages the development of saprophytes in the decaying leaf bases and helps to prevent *Botrytis*, a killing fungus, from reaching the stem.

[1640] 635.62-2.4-1.81
GRIES, G. A. Physiology of *Fusarium* foot rot of squash. *Conn. Agric. Expt. Sta. Bull.* 500, 1946, pp. 20. *R.A.M.* 28 (307-308).

Experiments with various soil mixtures indicated that *Fusarium solani* f. *cucurbitae* is relatively short-lived in organically amended soil. Soil amendments of S and KCl delayed the development of disease symptoms by as much as two weeks, but $\text{Ca}(\text{OH})_2$ appeared to encourage the disease. The amount was greatest when the Ca:K ratio was high.

[1641] 635.64-1.544.7:581.192
HOLMES, A. D.; TYSON SMITH, C.; ROGERS, C., ET AL. Effect of different mulches upon the nutritive value of tomatoes. *Soil Sci.* 65, 1948 (471-475). [Mass. Agric. Expt. Sta.]

In a 6-year experiment on a fine sandy loam, tomatoes were mulched with banana fibre for 3 years followed by Servall (shredded sugar-cane stalks) for the remaining 3 years, horse manure and wood shavings and rye straw. Water content, total and soluble solids, sugars and ascorbic-acid values were unaffected by mulching while the levels of carotene, Ca, Mg, Mn, N, P and K were increased. Except in the case of N, straw, followed by Servall, appeared to be more efficacious than manure.

[1642] 635.64-1.81
SAYRE, C. B.; VITTM, M. T. **Comparison of fertilizer ratios for tomatoes.** *N.Y. St. Agric. Expt. Sta. Rept.* 1947, 1948 (52).

In experiments with tomatoes and loam soil of pH 5.6, 50, 100 and 150 lb./acre of N, 100 and 200 lb. of P_2O_5 and 50, 100 and 150 lb. of K_2O were applied. There were no significant differences in yield between the 3 levels of N, higher applications of P increased yield significantly and although there was progressive increase in yield from increasing amounts of K the differences were not significant. There was no gain from the application of 1 ton/acre of dolomitic limestone. Yields were highest from the application of 1000 lb./acre of 5-10-5 fertilizer; the addition of 10 tons/acre of manure gave no further increase. The most effective method of application was $\frac{3}{4}$ of the fertilizer ploughed under and $\frac{1}{4}$ applied in bands.

[1643] 635.64-1.816.3
EAVES, C. A.; CANNON, H. B. **Fertilizer placement in relation to yield and quality of tomatoes: incidence of blossom end rot.** *Int. Cong. Pure Appl. Chem.* 11, 1947. B.A. BIII (128).

Provision of additional side dressings to the broadcast-and-disc-and the drilled-fertilizer treatments produced significantly the highest initial and total marketable yields with low incidence of rot. Band-placement methods gave poor results, whilst the broadcast-and-ploughed treatment gave high percentage of rot.

[1644] 635.64-2.4-1.81
THOMAS, H. R. **Effect of nitrogen, phosphorus and potassium on susceptibility of tomatoes to *Alternaria solani*.** *J. Agric. Res.* 76, 1948 (289-306). [Bur. Pl. Indust., U.S.D.A.]

Plants grown in greenhouse sand culture at a high-P level, irrespective of N and K levels, or at a low-K level irrespective of N and P levels had, in 2 of 3 experiments, smaller leaf spots and fewer dead leaves than those grown at the low-P and the high-K levels. Plants receiving low N irrespective of P and K had smaller spots than high-N plants but showed no difference in dead-leaf percentage. High N + low P gave the highest dead-leaf percentage and high N + high P the lowest percentage. Plants receiving medium to high N and K and low P were the most susceptible to infection, while those receiving medium to high N, low to high K and high P were the most resistant. A limited field test showed little difference in the disease resistance of plants receiving the different treatments.

[1645] 635.646-1.86
DAWIS, V. M.; LABIS, F. L. **The influence of different kinds of animal manure on the yield of the eggplant.** *Philipp. Agricst.* 31, 1948 (199-205).

Eggplant seedlings were transplanted into holes filled with a mixture comprising 3 parts of clay loam and 1 part of dried farm manure, bat guano or rice-straw compost. Other seedlings were treated with 2.8 gm. of $(NH_4)_2SO_4$ per plant. Seedlings treated with pig manure were the slowest to recover after transplanting. The best size, colour and vigour were shown by plants treated with $(NH_4)_2SO_4$, chicken, goat and horse manure and bat guano in descending order of superiority. Earliest flowering was obtained with $(NH_4)_2SO_4$ followed by chicken, horse, goat and bat manure as one group and rice-straw compost, carabao and pig manure as another. Time of marketing was unaffected by treatment. The effects on yield also fell into groups, the highest yields being given by $(NH_4)_2SO_4$ and chicken and goat manure, the second highest by horse, bat and carabao manure and the lowest by cow and pig manure and rice-straw compost.

[1646] 635.65-1.5
MIMMS, O. L.; ZAUMEYER, W. J. **Growing dry beans in the Western States.** *U.S.D.A. Farm. Bull.* 1996, 1948, pp.42.

Beans are sensitive to very alkaline or very acid soil but are not sensitive to the

character of the soil so long as it is fairly fertile and well drained. They are not resistant to drought but some varieties can wait for the soil moisture they need during the fruiting stage. Autumn ploughing is recommended and ploughing under of lucerne is common. Manuring of bean crops is not usual, but beans are planted after manured crops, often after lucerne and sweet clover which have received 100 lb./acre of available P_2O_5 . N fertilizers may be effective. If beans follow beets, manure may be necessary on the beans.

[1647] 635.656-2.4-1.81
SCHROEDER, W. T. **Fertilizer carriers, soil amendments, and methods of application on the incidence of root-rot and yield of peas.** *N.Y. St. Agric. Expt. Sta. Rept.* 1947, 1948 (32).

Data obtained in a dry soil at planting time and with a minimum of rainfall between planting and emergence suggest that fertilizer burn is less important in reducing stands than had previously been believed. $NaNO_3$ was the most injurious of the N fertilizers used and Uramon the least injurious, with $(NH_4)_2SO_4$ and NH_4NO_3 intermediate. Contact placement decreased the severity of rootrot.

[1648] 635.98-1.67
SEELEY, J. G. **Methods of automatic watering of plants.** *Science* 108, 1948 (65). [Cornell Univ.]

Devices for automatically watering bench crops and potted plants are described. The system used is that of a constant water level.

GEOGRAPHICAL

(4) EUROPE

(See also Abs. No. 1500)

[1649] (411)553.97
FRASER, G. K. **Peat deposits of Scotland. Part II. Peat mosses of Aberdeenshire, Banffshire and Morayshire.** *Dept. Sci. Indust. Res. Geol. Survey Scotland, Wartime Pamph.* 36, 1948, pp. 29. [Macaulay Inst.]

The distribution of the major deposits, types of peat and the utilization of peats are described.

[1650] (416)631.4
LINEHAN, P. A.; MCCONAGHY, S.; STEWART, R. H. **The grasslands of Northern Ireland.** *J. Brit. Grassland Soc.* 3, 1948 (85-94). [Min. Agric. N. Ireland, and Queen's Univ., Belfast]

The soils of Northern Ireland are either peat or mineral soils. The peat soils are confined to the mountains and to the low lying areas in which the water table is near the surface. All land above 1000 feet is covered with peat, except where the gradient is steep; the lower limit is 600 feet. Such peat is of little agricultural importance. Low-moor peat is widespread and large areas have been reclaimed, usually after the peat has been removed. Good crops of oats, potatoes and ryegrass can be grown on such reclaimed soils but good quality pastures are rare. Many of the peat soils are acid. The mineral soils are derived mainly from glacial drift which is of local origin and the geological map is a fairly reliable guide to the soil distribution. All the soils are low in lime and available P. The light or sandy soils are low in K and bases generally, especially in the mica-schist and granite areas.

[1651] (42)631.81
OGG, W. G. **The role of fertilizers in the national economy.** *Fert. Feed. J.* 34, 1948 (329-336).

A historical outline is given of crop yields in England and of fertilizer experiments during the past 100 years. Data are given of fertilizer consumption in European countries in 1936 and in U.S.A. in 1939, expressed in plant food units. Fertilizer rationing during the war has led to more efficient use of fertilizers and the land is probably in better heart than it was before, though some of it is short of K. The part that fertilizers can play in the proposed increase in agricultural output in England and Wales of 15% above the war-time peak is considered. Lime deficiency is probably a limiting factor in production on many farms. An increase in fertilizer application of 49,000 tons of N (37% above 1946), 40,000 tons of P_2O_5 (14% above 1946) and 20,000 tons of K_2O (21% above 1946) will be required in England and Wales. There is room for improvement in methods of application, fertilizer placement and forms of fertilizers.

[1652] (437)553.97
VÁLEK, B. Předběžná zpráva k mapování
jihočeských rašeliníšť. [Preliminary
account of the peats of southern Bohemia.]
Lesnická Práce 26, No. 10, 1947, pp. 11.
[Cz.f.]

The thickness of the peats is variable, but not more than 3 metres. The lower layers are very suitable for fuel. Most of the peats are of the high-moor type, and some are of an intermediate type (Übergangsmoor).

[1653] (437)631.4
ŠTRÁDAL, V. Vliv matečné horniny na
vývoj půdních typů na Poděbradsku. [The
influence of the parent rock on the
evolution of soil types near Poděbrady.]
Sborn. Čsl. Akad. Zeměd. 19, 1946 (354-358).
[Cz.e.r.]

Climatic soil types include brown forest soils and chernozems, with podzolic soils in forest areas with a permeable substrata. The main types, however, are azonal meadow soils on recent alluvium and intrazonal rendzinas on highly calcareous parent material. The parent material is the predominant factor in the evolution of these soils.

[1654] (438)631.4 : 551.311.33
DOBRAŇSKI, B. Charakterystyka niek-
tórych gleb lessowych północnej krawędzi
Podola. [Characteristics of some loess
soils on the northern margin of Podolia.]
Ann. Univ. Mariae Curie-Skłodowska, 2E,
1947 (139-172). [Pl.e.]

The loess soils are mapped and classified as (1) complex of podzolized loess soils including podzolized soils, slightly podzolized soils, boggy podzolized soils and regraded loess soils; (2) shallow loess soils which are differentiated into soils on chalk, soils overlying an impermeable layer, and soils on other substrata; (3) complex of deluvial loess soils, sandy loams and loams, including deluvial loess soils, deposited loess soils, mixed loess and sandy soils and soils on loessy sand. The mixed loess and sandy soils and regraded loess soils are the most fertile; soils of the lowest agricultural value are podzolized and shallow loess soils with an impermeable layer.

[1655] (47)631.4
ANTIPOV-KARATAEV, I. N. [The progress
made and the problems of the chemistry

of soils in the U.S.S.R. in connexion with
30 years of the Soviet regime.] *Poch-
vovedenie* 1947 (600-606). [R.]

[1656] (477)631.445.3
SOKOLOVA, E. I. [The nature of the
brown mountain forest soils of the
Crimea.] *Pochvovedenie* 1947 (452-464). C.A.
42 (3884). [R.]

Chemical data on the soils and chemical and mineralogical data on soil fractions are given. The soils are saturated with bases and contain both montmorillonite and kaolinite types of minerals. The fractions smaller than 1 μ were X-rayed and differential thermal analyses were made on them. In spite of difference in the type of parent material—quartzdiorite, limestone, shale and mixed deluvium—the minerals in the profile are about the same.

[1657] (479)631.48 : 551.41
GAVRILIUK, F. YA. [Vertical zonality of
soils in the Caucasus.] *Pochvovedenie* 1947
(488-496). C.A. 42 (3883). [R.]

Chemical data on soils show that the southern slopes differ markedly from the northern.

[1658] (497.2)631.4
YANKAVIEV, K. P. [The stratigraphy and
origin of soils of the post-glacial period
in the Sofia plain in relation to climatic
changes.] *Pochvovedenie* 1947 (465-476).
[Sofia.] [R.]

The soils of the plain have been affected by the climatic conditions prevailing in the Würmboreal, boreal, atlantic, sub-boreal and sub-atlantic epochs of the Quarternary. The complex influences of these epochs on the morphology and characteristics of present day soils are discussed.

[1659] (497.2)631.4 : 016
BUKORESHCHLIEV, B. Bulgarian soil
literature. *Pochvovedenie* 1947 (751-757).
A bibliography 1913-1947.

(5) ASIA

(See also Abs. Nos. 1462, 1501)

[1660] (51)551.5
BORCHERT, J. R. A new map of the
climates of China. *Ann. Assoc. Amer.
Geog.* 37, 1947 (169-176). [Univ. Wis.]

The map is based on a modified Köppen classification.

[1661] (51)631.47
LEE, SHU-TAN. **Delimitation of the geographic regions of China.** *Ann. Assoc. Amer. Geog.* 37, 1947 (155-168). [Nat. Cent. Univ., Nanking and Univ. Md.]

Topographic, drainage, climatic, soil, vegetation, land use and agricultural regions as delimited by earlier workers are mapped and to these is added a new map of geographic regions which the author suggests may be useful for planning post-war economic development.

[1662] (51)633.72-1.5
WANG, W. T. **Le théier en Chine et les thés de Chine.** [**The tea plant in China and China teas.**] *Rev. Int. Bot. Appl.* 26, 1946 (512-517). *Ann. Trop.* 3 (209). [F.]

Information on the culture of tea in China.

[1663] (527.5)631.4
PETROV, B. F. [**The soil covering of South Sakhalin.**] *Pochvovedenie* 1947 (641-651). [R.]

Soil types found in Sakhalin include alluvial, grey-podzol, marsh and podzol soils. Out of 722,000 ha. potentially useful as either arable or pasture land only about 30,000 ha. are cultivated. The two main crops are oats and potatoes, but experiments have shown that high yields can be obtained from most temperate climate crops. Bibliography.

[1664] (54)631.416 : 631.472
GUPTA, U. N. S.; SEN, A.; UKIL, A. C. ET AL. **Comparative studies on Indian soils. VI. The depth distribution of water-soluble salts in the profile.** *Indian J. Agric. Sci.* 16, 1946 (307-315). [Imp. Agric. Res. Inst., New Delhi]

Indian soils may be classified into 5 main groups according to the nature and concentration of soluble salts at different depths. In group 1, Na and Cl predominate and soluble-salt concentration is highest at the surface and lowest at the bottom of the profile. In group 2, sulphate is low and soluble-salt concentration is highest at the top and lowest at an intermediate level in the profile. Group 3 has a predominance of either Ca, Na, SO₃ or Cl and salt concentration is highest at an intermediate level. Group 4 has very high salt content and concentration is highest at the bottom

of the profile. Group 5 has low content of soluble-salts distributed more or less evenly throughout the profile.

[1665] (54)631.417.4 : 631.472
SATYANARAYANA, K. V. S.; SWAMINATHAN, K.; VISWA NATH, B. **Comparative studies on Indian soils. VII. Carbon and nitrogen status of Indian soils and their profiles.** *Indian J. Agric. Sci.* 16, 1946 (316-327). [Imp. Agric. Res. Inst., New Delhi]

The organic C and N contents of 43 uncultivated soil profiles distributed over India were examined. The general level of C and N in most of the soils was low and the C/N ratios fluctuated from 5 to 25. The soils are liable to be depleted of organic matter under normal agricultural practices and require a constant supply of organic matter and N. No correlation could be found between climate and N content.

In the brown soils of the arid region the C content decreased more rapidly with depth than did the N content, but in the semi-arid areas neither the N content nor the C content differed much with depth. The C/N ratio was above 11 with slight variations in the profile. In the brown soils of the humid region the C content was either steady or increased slightly within the first 3 feet and then decreased. The C/N ratio increased in the second and third foot and decreased lower down. In the per-humid region there was on the whole a gradual decrease of C and N with depth.

In the grey and pink soils of the arid zone C and N contents decreased with depth and the C/N ratio was high. In the semi-arid regions the N content was high and uniform at all depths; the C content was low and the C/N ratio very narrow with a slight decrease downwards in the profile.

Black soils occur in semi-arid and humid regions. The N content of these soils in semi-arid regions decreased slightly with depth; the C/N ratio did not vary much with depth and the ratios were fairly wide. In the black soils of the humid region the C and N contents were similar to those in the semi-arid region and decreased slightly with depth. As the amount of rainfall increased the C/N ratio narrowed.

Red soils occur in the humid and per-humid regions. In the profiles of the humid

regions there were indications of leaching of organic matter with accumulation in the lower horizons. Surface soils from the per-humid zone contained high amounts of C and N which decreased with depth.

In calcareous soils in arid regions C and N contents decreased with depth and the C/N ratio was fairly uniform. In the humid regions both C and N decreased rapidly with depth.

[1666] (54)631.851
JAYARAMAN, N. **Phosphate fertilizers.**
Proc. Natl. Inst. Sci. India 9, 1943 (147-154).
[Inst. Sci., Bangalore]

The only occurrence of P deposit on a sufficient scale in India is near Trichinopoly where it occurs as tricalcium phosphate in the form of nodules together with CaCO_3 and CaF_2 . A process is described of heating the rock with silica or potash feldspar and Al_2O_3 or MgO . It is highly probable that a product quite as rich in available P_2O_5 as ordinary super. could be obtained from these deposits and the presence of about 4% of available K_2O would increase the value of the product as a fertilizer.

[1667] (548.7)631.4
JOACHIM, A. W. R.; KANDIAH, S.
Studies on Ceylon soils. XVII. The physical and physico-chemical characteristics of the major soil types of Ceylon.
Trop. Agrist. 103, 1947 (71-84).

The soils of the wet zone are lateritic or laterite, and as compared with those of the dry zone, which are non-lateritic or lateritic, they have lower exchangeable-base capacities and are thus of lower mineral nutrient status. They are less saturated with bases and are thus more acid in reaction. Being more permeable, less dispersible, and more friable when dry, they drain better, are less erodible and are more amenable to cultivation under varying moisture conditions. As regards physical properties, Ceylon soils are not dissimilar to the laterite and red soils of India and other tropical countries, and where marked divergences occur they relate to local soils of high organic-matter content.

High positive correlations exist between the clay content and the water-holding capacity, sticky-point moisture, loss on ignition and moisture equivalent of the soils. The organic content is similarly correlated

with these properties. The ultimate pH of the soils is related inversely to the $\text{SiO}_2/\text{R}_2\text{O}_3$ ratio. The base-exchange capacity is determined by the nature and amount of both (1) clay and (2) organic matter, the contribution of (1) varying from 0.05 to 0.55 m.e. per gm. and of (2) from 1.1 to 4.7 m.e. per gm.

[1668] (548.7)631.459
LIVERA, E. J. **Agriculture and erosion in Ceylon.** *Trop. Agrist.* 103, 1947 (234-239).

The former system of land use in Ceylon achieved a measure of soil and water conservation. Paddy alternated with grass fallow in the lowland while on the dry areas of the highlands a periodical return of fertility was ensured by the practice of *chena* or shifting cultivation, undisturbed by grazing. The present overgrazing of both the paddy during its fallow period and the *chena* have increased erosion and also the area of poor scrubland. A programme of research is urged to test the efficiency of present and alternative methods of cover cropping and mulching, tillage and the retention or non-erosive disposal of rainwater.

[1669] (56)631.416
HORN, V.; ESAT-KADASTER, I.; KANSU, S.
[Analysis of Turkish soils.] *Ankara Yüksek Zir. Enstitüsü Derg.* 8, 1947 (314-322).
C.A. 42 (3886). [T.]

Steppe soil is rich in Ca, but poor in easily assimilable P and N. The deeper layers have a higher nutrient value. The red soil of Cukurova is high in P, but poor in Ca.

[1670] (57)633.1-1.58
POPOVSKY, A. **Without ploughing. New work by Academician Trofim Lysenko.** *Voks Bull.* 1946, No. 5-6, (25-31). *Biol. Abs.* 22 (943).

In the steppelands of Siberia where the soil is still frozen in June, wheat and rye can be planted in the late summer on unploughed fields where the stubble has been left; the yield is greater than that from seed sown in ploughed soil. The moisture content is less in the undisturbed soil and this is an advantage since accumulated water freezes and destroys seedling roots. The stubble holds the snow and protects the plants from the wind.

[1671] (587)631.459 : 631.67
PRESNIAKOVA, G. A. [Processes of irrigation erosion in the mountains and foot hills of Tien Shan.] *Pochvovedenie* 1947 (746-750). [R.]

Irrigated soils are washed away by irrigation water on all slopes over 20°. Another form of erosion is the gulying of the irrigation channels of primitive design.

(6) AFRICA

(See also Abs. Nos. 1561, 1612, 1617)

[1672] (661)553.97
DUBOIS, G.; DUBOIS, C.; JAEGER, P. Sol tourbeux d'*Eriospora* dans les Monts-Loma, en Afrique occidentale. [Peaty soil of *Eriospora* in the Loma Mountains, West Africa.] *C.R.* 227, 1948 (217-218). [F.]

A peat formed from *Eriospora pilosa* Benth. and situated at an altitude of 1300 metres to the north-east of Sierra Leone had many resemblances to a European mountain peat.

[1673] (665.2)631.459
SUDRES, A. La dégradation des sols au Foutah Djallon. [Soil degradation in the Foutah Djallon] *Agron. Trop.* 2, 1947 (227-246). [F.]

The topography, climate and vegetation of an area in French Guinea are described with a short note on the soils. The causes of degradation are analysed with particular reference to the practice of burning scrub. A suggested programme for the control of soil degradation consists of limiting the production of secondary cereals such as Fonio (*Digitaria exilis*) which has contributed more than any other factor to the degradation of the soils, increasing maize acreage, reafforestation, control of scrub fires, development of special crops, particularly citrus, and creation of new resources.

[1674] (671)631.4
PORTÈRES, R. Esquisse géologique et agropédologique des Hauts-Plateaux de Dschang-

Foumban au Cameroun Français. [A geological and agropedological outline of the Hauts-Plateaux of Dschang-Foumban in the French Cameroons.] *Agron. Trop.* 3, 1948 (153-173). [F.]

The soils were lateritic, brown and alluvial. The brown-red to brown soils at a height of 1000 and 1600-1700 m were particularly suitable for coffee growing.

[1675] (672)631.4
BÉTRÉMIEUX, R. Les sols du moyen Logone et de la zone de capture. [The soils of the Middle Logone and of the catchment zone.] *Agron. Trop.* 3, 1948 (140-152). [F.]

Under a thin, greyish upper horizon the profiles of soils that have developed on the recent sedimentary formation of the Chad bowl are light grey, or yellowish or brownish in colour. In the deeper depressions they are rather darker. These soils form a transition stage between the lateritic soils of the South and the desert or semi-desert soils of the North. As far as the agricultural value of these soils is concerned the limiting factor is the lack of moisture.

[1676] (672)631.4
ROLLEY; LHUILLIER; BÉTRÉMIEUX, R. Possibilités agricoles du bassin du Logone. [The agricultural possibilities of the Logone Basin.] *Agron. Trop.* 3, 1948 (115-139). [F.]

The fertility of the soils of the Logone Basin is average and development should be possible by improved agricultural methods. Rice and cotton are admirably suited to this environment. The Logone flood water should be reserved for the heavy, most fertile soils on which dry-land or irrigated rice appears to be the most suitable crop. The annual floods of the Logone are comparable to the Nile floods and, like the Nile floods, are supposed to increase soil fertility. There is some doubt about this as analyses have so far shown that the Logone waters are not particularly rich in minerals. The river has only limited possibilities for irrigation owing to the moderate extent of the floods and their coincidence with the rainy season.

[1677] (68.01)631.459 : 631.61
FARMER'S WEEKLY. Grain soils plundered for profit. *Farm. Week. S. Africa* 75, May 5, 1948 (52-53, 55, 57).

A summary of Prof. Talbot's report "Swartland and sandveld" (Oxford Univ. Press), describing the wind and gully erosion and the wrong land-utilization, farming and unco-ordinated conservation practices which have caused this erosion in the cleared and ploughed western lowlands of Cape Province. Land utilization must be planned in accordance with climatic, soil and relief conditions, with stock raising replacing grain farming in areas of low and unreliable rainfall. Depleted soils should be rested under lucerne for several years in each rotation. Contour cultivation, with the changing of fields and fence patterns where needed, systematic gully reclamation and the provision of properly spaced and graded drainage ways on the steeper lands are essential.

[1678] (68.01)631.86:636.3
ORCHARD, E. R.; LUDORF, R. **The composition and use of Karoo manure, with notes on kraal manure, compost and karoo-manure ash.** *Farm. S. Africa* 23, 1948 (241-253). [Div. Chem. Serv., Pretoria]

Karoo manure has accumulated in arid and semi-arid sheep-farming areas where animals are concentrated at night in kraals. Exposure to weather has not caused serious decomposition. Rainfall rarely exceeds 15 inches and there is little loss due to leaching. The milled manure can be applied through a fertilizer drill either alone or mixed with super.

Analytical data are given of moisture, loss on ignition, total N, P_2O_5 , K_2O , Cl and Na. Total-N content is high, being on an average 1.68%. P_2O_5 content is about 1% and the phosphate is readily accessible to plants. A dressing of 5 tons/morgen of crude manure supplies as much P_2O_5 as 400 lb. of super. and the residual effect of karoo manure is greater. It is recommended that karoo manure should be supplemented with P fertilizers before application. The manure is exceptionally rich in K, containing 5% of K_2O . The Na content, chiefly as NaCl, is 2.57%. A dressing of 5 tons/morgen will add at least 400 lb. of NaCl to the soil and there is considerable risk of crop injury. The average pH is 9.4. There is a strong positive correlation between loss on ignition and N content, but the P_2O_5 content decreases with increasing values for loss on ignition.

[1679] (68.01)633.71-1.582
N(—), G. W. **Crop rotation trials on tobacco lands.** *Farm. Week. S. Africa* 75, June 23, 1948 (52-53).

A system in which tobacco is grown only once in 4 years has proved the most profitable in the long run. In view of nematode attacks, all vegetables—particularly potatoes and tomatoes—should be excluded from the rotation; suitable crops are sunnhemp, velvet beans, grasses and cereals. Under irrigated conditions, every rotation should include a green-manure crop, for which velvet beans or sunnhemp are suitable.

[1680] (68.01)634.3-1.5
MYNHARDT, C. B. **Cultivation of citrus orchards in the Eastern Cape Midlands.** *Citrus Grow.* 161, 1947 (3, 5). *Biol. Abs.* 22 (952).

Deep cultivation should be avoided and weed growth should be encouraged between May and August. If water supplies are adequate, summer cover crops are recommended, but if water is scarce the orchard should be kept clean from September to March.

[1681] (683)631.459:631.61
SWAZILAND VETERINARY AND AGRICULTURAL DEPARTMENT. **Soil erosion and the conservation of soil and water in Swaziland, 1944.** *Swaziland Vet. Agric. Dept.* (n.d.), pp.48.

An account is given of erosion due to overstocking, unrestricted grazing, burning and poor methods of agriculture, and reclamation measures are recommended. A draft Proclamation makes provision for the control of natural resources by local Resources Boards; for afforestation and improvement of native agriculture and ploughing; for the control of fencing, contouring and burning; for the setting up of Intensive Conservation Areas; for the protection of despoiled or deteriorated areas; for destocking and limitation of stock and setting aside areas for the protection of natural resources and irrigation works.

[1682] (694)633.526.23-1.5
HÉBERT. **Le sisal aux îles Comores. [Sisal in the Comoro islands.]** *Agron. Trop.* 2, 1947 (279-298). [F.]

A short account of sisal cultivation in these islands with more complete details of the after-treatment of the crop.

(7) NORTH AMERICA

(See also Abs. Nos. 1594, 1610)

[1683] (71)631.473
STOBBE, P. C. **Soil surveys in Canada.** *Agric. Inst. Rev.* 3, 1948 (208-212). [Expt. Farms Serv., Ottawa]

An outline study. Detailed surveys have been made of 2,000,000 acres in intensely developed areas or in special areas for irrigation etc., the results being shown on maps of scale 4 inches : 1 mile. About 135,000,000 acres mainly in settled areas have been surveyed along traverses from 2 to $\frac{1}{2}$ mile apart and mapped at $\frac{1}{2}$ to 1 inch : 1 mile. 75,000,000 acres of unoccupied land have been broadly surveyed. A list of reports and maps issued to date is provided.

[1684] (711)633.2.03
TISDALE, E. W. **The grasslands of the southern interior of British Columbia.** *Ecology* 28, 1947 (346-382). *Biol. Abs.* 22 (777).

There is marked zonation of climate, soils and vegetation. Three climax grassland associations occur on Brown, Chestnut and Black-Earth soil zones.

[1685] (714)633.71-1.5
BORDELEAU, R. **Quebec can grow good cigar leaf tobacco.** *Better Crops* 32, No. 1, 1948 (19-22, 47-49). [Expt. Sta., L'Assomption, Quebec]

In Quebec, tobacco is grown on alluvial loamy, sandy and clay soils. The alluvial soils have grown tobacco continuously for 40-50 years and are the best type for cigar binder tobacco. They are deep, well drained and suffer little from drought. The next best are the loams on which $\frac{2}{3}$ of the cigar tobacco is grown. The subsoil is generally clayey. The clay soils are generally too compact, heavy and poorly drained; they pack hard in dry periods and cultivation is difficult. Their high Cl content impairs the fire-holding capacity of cigar leaf. The sandy soils are poor and excessively drained and dry out when the crop most needs moisture for rapid growth. The burn of tobacco depends on soil type and is not affected by the preceding crop, which, however, affects yield and quality. Continuous tobacco produces the best leaf, but this can only be

practised on alluvial soils. Tobacco grown 2-3 years in succession in a 5-6-year rotation is best on other soils. Results are good after pasture or cereals but not after hay or hoed crops.

Soil reaction influences yield and quality but does not effect fire-holding capacity. Tobacco thrives on a soil of pH 5.1-5.6 and black root-rot tends to develop on neutral or alkaline soils. If lime is needed it should be applied to the cereal following the tobacco crop. Farmyard manure is used extensively at the rate of 13-27 tons/acre together with 1000 lb./acre of 5-8-7 or 5-8-10 fertilizer. Yield and fire-holding capacity increase with increasing amounts of available N, but for optimum quality the amount of N need not be so high. P increases yield, but has less effect on quality and burn. K increases yield, quality and burn and for good crops the soil should contain 300-400 lb./acre. Results are best when the P/K ratio is 1 : 5. Yield increases with increased content of organic matter in the soil.

[1686] (714)634.9-1.4:551.58
VILLENEUVE, G. O. **Climatic conditions of the Province of Quebec and their relationship to forests.** *Quebec Forest Protect. Serv. Bull.* 6, 1946, pp. 144. *Biol. Abs.* 22 (254).

Meteorological observations made during 1936-1944 at more than 200 stations form the basis of this investigation. The treeless tundra is the result primarily of low temperature. In general, temperature and precipitation determine the forest regions and the composition of the forests. The soils are generally podzols, but textural differences due to differences in parent material determine local forest composition. Soil conditions may influence the rate of growth, size and form of trees without affecting the species composition. At the same time, differences in vegetation of climatically similar sections are probably the result of soil differences. Soils appear to be the primary factor determining the character of the vegetation in 4 out of 13 conifer-forest sections; soil and climate seem to be equally important factors in 1 conifer section and in 3 out of 4 mixed-forest sections. Climate appears to be the determining factor in all the other forest sections and in the tundra region.

[1687] (715)631.459 : 631.61
 AGRICULTURAL INSTITUTE OF CANADA, NEW
 BRUNSWICK BRANCH. **Soil conservation
 and land use in New Brunswick.** *Agric.
 Inst. Rev.* 3, 1948 (213-248).

20% of the farms existing in New Brunswick in 1870 have been abandoned. Since 1891 there has been a steady decrease in the number of farms and the acreage of improved land. The problem is discussed under the headings land use, erosion, fertility and irrigation, drainage and flood control. Recommendations are made concerning fact-finding surveys and the development of a land policy and action programmes.

[1688] (729.8)631.433.1 : 631.432.2
 HARDY, F.; DERRAUGH, L. F. **The water
 and air relations of some Trinidad
 sugar-cane soils. Part I.** *Trop. Agric.
 Trin.* 24, 1947 (76-87).

Moisture and air relationships on sandy and clayey sugar-cane soils, studied at 4-monthly intervals in 1943-45, showed that during wet weather both soils were inadequately aerated because of impeded drainage. During dry weather the sandy soil was excessively aerated though not necessarily deficient in available moisture. In the clayey soil, aeration was even more excessive because of the development of deep cracks, and available moisture was then very deficient. Soil-moisture data for the top and second foot layers of similar soils obtained in 1927, an exceptionally wet year, and 1928, a very dry year, showed that both soils were inadequately aerated throughout the wet year. The clay soil was almost continuously water-logged but the sandy soil was better aerated in the top foot during the dry season of the year. Both soils had abundant supply of available moisture throughout 1927, but cane plants were probably unable to utilize it fully because of root asphyxiation induced by poor aeration. During the dry year both soils were excessively aerated and the clay soil contained much less available moisture than the sandy soil.

Measurements of infiltration rates on sandy and clayey soils collected in shallow cylinders without disturbing the soil structure showed that infiltration was more rapid in clayey than in sandy soil even though the soils were saturated and covered with a

layer of water throughout the trials. Smearing the wet clay soil with the finger reduced infiltration to zero.

When wide cylinders 18 inches long were sunk into both kinds of soil under slightly dry conditions and a constant head of water maintained, percolation was many times as rapid in the clay as in the sand because of deep cracking. The functions of cracks are discussed in detail. Although cracks develop only on soil freely exposed to intense drying and are probably most abundant and conspicuous in clay soils deficient in organic matter and devoid of litter, they play an important part in soil-moisture and soil-air relations.

[1689] (729.8)633.61-1.81
 POTTER, J. A. **Fertilizer field experiments
 with sugar-cane on phosphate-deficient
 soils in South Trinidad.** *Trop. Agric.
 Trin.* 24, 1947 (94-108).

Mitscherlich pot tests and chemical tests were made on the two main sugar-cane soils of the district. The P requirements of the red soil and of the eroded black soil were exceptionally high, of the order of 10 cwt./acre. The P requirement of the uneroded black soil was about 4 cwt./acre. The N requirements of the soils were also high, (8 to 20 cwt. of $(\text{NH}_4)_2\text{SO}_4$ per acre-nine-inches of soil), but their K requirements were low. Previous field experiments had indicated that the optimum dressing of $(\text{NH}_4)_2\text{SO}_4$ applied with or without small nominal amounts of super. and K_2SO_4 was 3 cwt. per acre.

In preliminary field trials on a commercial scale, yields with high-P—high-N fertilizer treatment (6 cwt. of super. + 8 cwt. of $(\text{NH}_4)_2\text{SO}_4$ per acre) were compared with those obtained with the routine practice (3 cwt. of $(\text{NH}_4)_2\text{SO}_4$ per acre). The average yield on the red soil was 51.7 tons/acre of cane with the high-P and high-N treatment, whereas with the routine treatment it was 34.1 tons/acre, the corresponding figures for the black soil being 67.8 and 51.2 tons/acre. The main visible effect of high-P—high-N manuring was an increase of nearly 50% in tiller counts for canes growing on red soil. The increased yield of canes on red soil is attributed to the stimulating effect on the root system of high dosages of soluble P applied around the base of the plant, the concentration of P apparently being sufficiently

large to overcome locally the high P-fixing capacity of the active Fe component of this soil, while the abundant N enabled the large number of tillers to grow to maturity. The high-P treatment also diminished the number of tons of cane needed to make a ton of sugar.

[1690] (73)631.81
SCHOLL, W.; WALLACE, H. M. **Fertilizer consumption in the United States.** *Agric. Chem.* 3, 1948, No. 6 (24-29, 59).

A survey of the tonnage of grades of commercial mixtures and materials used for direct application to the land in 1946/47.

[1691] (73)631.83
AGRICULTURAL CHEMICALS. **Potash.** *Agric. Chem.* 3, No. 4, 1948 (23-26, 75-76).

Amounts produced in the United States and market conditions met since 1914.

[1692] (76)633.13-1.5
ATKINS, I. M.; MCFADDEN, E. S. **Oat production in Texas.** *Tex. Agric. Expt. Sta. Bull.* 691, 1947, pp. 66.

A description is included of the culture, place in the rotation—usually after maize or cotton—and seedbed preparation.

[1693] (77)631.4:581.5
WILDE, S. A.; WHITFORD, P. B.; YOUNGBERG, C. T. **Relation of soils and forest growth in the driftless area of southwestern Wisconsin.** *Ecology* 29, 1948 (173-180). [Univ. Wis.]

Two transects in the unglaciated area of S.W. Wisconsin were studied. The region shows sharply dissected cuestas with narrow ridges capped by sandstone or limestone and deep valleys. Separate soil-vegetation units are described:—*prairie soils* which have a deep humus layer and resemble "chernozems" but are acid and lack the carbonate-rich horizon; *prairie-forest soils* of sandy or silt-loam texture and representing the first stage of degradation of prairie soils; *nut-structured loams* of medium texture, good aeration, moderate acidity and abundant nutrients and with profiles characterized by a thin layer of litter and a deep nutty B horizon; *podzolized nut-structured loams*, distinguished from the previous types by a layer of raw humus; *eroded loams* confined to the steeper slopes, with a variable morphology and

scarcity of humus in the profile; very fertile *overwash loams* formed on the lower slopes by deposition of eroded material and with deep black surface layers; *gley loams* which are confined to the marsh borders; *limestone rockland* with shallow dark surface soil grading into a calcareous substratum and with a cover of prairie plants and scattered trees; wind-blown *dune sands* where reforestation is justified only for reasons of erosion control; *outwash sands* with a profile made up of a thin layer of litter, a 4-6 inch layer of humus and a coarse sandy substratum and with a ground cover including many species of prairie origin; *sandstone rockland*, non-podzolic outcrops of sandstone with a thin mantle of weathered soil; *podzolized sandstone rockland* confined to outcrops bordering protected river coves; *stream bottom soils* and *flood plain soils* characterized by deep humus horizons and mottled gley substrata; *moss peat* with an acid organic layer derived from *Sphagnum* moss and underlain by mottled gley, and *sedge peat* which consists of the alkaline remains of sedges overlying mottled, structured marl or blue clay. Vegetation, yields and types of timber and reforestation possibilities are presented for each unit.

[1694] (78)631.432
FISHEL, V. C. **Ground-water resources of Kansas.** *Trans. Kans. Acad. Sci.* 50, 1947 (105-114).

In much of Kansas, underground water is a more important resource than surface water. Methods of determining the extent of this water and of conserving it are discussed in outline.

[1695] (78)633.491-1.5
ENZIE, J. V.; EYER, J. R. **Increasing Irish potato yields in New Mexico.** *N. Mex. Agric. Expt. Sta. Bull.* 342, 1947, pp. 35.

Recommendations are made dealing with soil types, rotations, fertilizers, varieties, seed, seedbed preparation, planting, cultivation, irrigation and pest control.

[1696] (79)632.51
HUTCHISON, C. B. **Problems faced in California on chemical weed control.** *Agric. Chem.* 3, No. 4, 1948 (37, 39).

An outline of the development of weed research and control projects in California since 1930.

(8) SOUTH AMERICA

- [1697] (85)631.4
 ARMERO, L. DE. Estudio sumario de los suelos del Rio Mantaro. (Continuacion). [A study of the soils of Rio Mantaro (continuation).] *Agronomia Peru* 11 (11-19). Agron. Trop. 3 (201). [Sp.]
 Description and analytical results.

- [1698] (86)63
 AGRICULTURA TROPICAL. El Departamento Nacional de Agricultura y el desarrollo de las campañas agrícolas oficiales. [The National Department of Agriculture and the development of official agricultural activities.] *Agric. Trop. Bogotá* 4, No. 4, 1948 (19-75). [Sp.]

The nature and scale of the agriculture of each of the 15 departments of Colombia together with the plans and activities of the Department of Agriculture operating through the corresponding 15 "technical administrative zones" are described.

- [1699] (86)631.44
 JENNY, H. Great soil groups in the equatorial regions of Colombia, South America. *Soil Sci.* 66, 1948 (5-28). [Univ. Calif.]

The climates of Colombia and U.S.A. are compared on the basis of "climatic fields" in which range of annual temperature or temperature efficiency and range of annual precipitation or precipitation effectiveness are considered. Graphs indicating the climatic fields of Colombia and of U.S. east of the Rocky mountains show that, although the climatic fields of both overlap, Colombia has a wider range of annual temperature and precipitation, suggesting that Colombia may possess a series of climatic soil types or zonal soils which do not occur in the U.S. The following great soil groups are described and mapped in the climatic field: cold humus soils, podzols, humic yellow-brown soils, Cauca Valley soils; tropical grey-brown soils, tropical yellow-brown soils, podzolic yellow soils, red earths, claypan soils, hardpan soils and rendzinas. The classification of these soils into conventional zonal and intrazonal soils leads to conflict with their accepted definitions. Zonal soils such as humic yellow-brown soils, red earths and podzols are climatically closely associated and yellow soils and

podzolic yellow soils of the rain forest possess similar bioclimatic environments. The present climate, age of the soil and parent material are deciding factors in these soils, and the concept of soil sequences offers a solution to the problem of soil classification. Comparable great soil groups arranged in climosequences or chronosequences link each great soil group systematically to other great soil groups.

- [1700] (86)631.459: 631.61
 RANGHEL GALINDO, A. La conservación de los suelos en Colombia. [Soil conservation in Colombia.] *Agric. Trop. Bogotá* 4, No. 4, 1948 (111-114). [Sp.]
 Short notes on the common practices.

(9) OCEANIA

(See also Abs. Nos. 1470, 1576, 1578, 1609)

- [1701] (92)631.4: 549
 DRUIF, J. H. On the occurrence of diaspore and zunyite in detrital sediments of Palembang. *Meded. Alg. Proefsta. Landbouw* 67, 1948, pp. 5. [E.]
 [Inst. Soil Res., Buitenzorg]

Diaspore in large amounts and zunyite in small amounts have been identified in sand samples from red lateritic soils developed on detrital sediments.

- [1702] (931)633.71-1.4
 ADAMSON, N. J. Establishing a tobacco farm. *N.Z. J. Agric.* 73, 1946 (37-38).

Commercial tobacco growing in New Zealand is confined to the Nelson district where summer temperatures are high, rainfall is at least 35 inches a year with good rains from November to January and with no storms or high winds during the growing months November-March. Only sands and sandy loams are suitable for the flue-cured type but the air-dried type grows on medium loams.

- [1703] (935)634.61-1.4
 DAVIS, C. M. Coconuts in the Russell Islands. *Geogr. Rev.* 37, 1947 (400-413). *Biol. Abs.* 22 (424).

The low terraces that provide the best sites for plantations are underlain by coral deposits of great depth. The terraces are covered with a heavy, black, friable soil ranging in depth from 5 feet on the level to 2 feet on the hill slopes.

[1704] (94)633.85
POGGENDORFF, W. **A review of the vegetable oil position.** *J. Aust. Inst. Agric. Sci.* 14, 1948 (1-8). [N.S.W.]

The chemistry of the vegetable oils and vegetable-oil consumption in Australia are reviewed. The possibilities are investigated of growing the following crops in Australia: (1) drying oils: linseed, tung, perilla, candle-nut (*Aleurites moluccana*), hempseed; (2) semi-drying oils: safflower, saffron thistle, soybean, sunflower, maize, cottonseed, sesame; (3) non-drying oils: rapeseed, wild rape, turnip, mustard, peanuts, castor, olive, coconut. Crops considered most capable of development are linseed, tung, castor and safflower, and the edible oil crops sunflower and peanuts.

[1705] (943)634-1.81
ROSS, A. A. **Management of the orchard soils of the Stanthorpe district.** *Queensland Agric. J.* 66, 1948 (13-19).

The growing of green Stanthorpe manure crops is the most practical method of increasing the organic-matter content of these soils. Large quantities of artificial fertilizers should not be applied to deciduous fruit trees except stone fruits, but leguminous green-manure crops should receive $2\frac{1}{2}$ cwt./acre of 4:15:2 fertilizer and cereal crops $1\frac{1}{2}$ cwt./acre of $(\text{NH}_4)_2\text{SO}_4$ or its equivalent N content in some other form.

Shallow trashy cultivation is preferable to deep working.

[1706] (944)631.459: 631.61
FRASER, H. A. **Soil conservation in eastern Riverina Woodville demonstration, Junee.** *J. Soil Conserv. Serv. N.S.W.* 4, 1948 (58-63).

Conservation measures were adopted on 1,140 acres of arable and grazing land ranging from 6% to 12% slope in order to protect a further 1000 acres of lower flat land subject to flooding and extensive gullyng. Pasture furrows were installed on a vertical interval of two feet on grazing land which has since held almost all the intense rainfall received, also growth has increased on each side of the furrows. Run-off from arable land was prevented by the construction of graded banks which discharged into two main grassed waterways. These in turn discharged through a series of dams and a

vegetated spillway on to a flat area of sown lucerne and pasture, spreader banks effecting even distribution. An area severed by large gullies was contour furrowed and planted with trees. Contour cultivation, preservation of stubble and wider rotations were also practised.

[1707] (944)631.459: 631.61
NICHOLAS, H. T. **Erosion under control in the Arthurville-Wellington district.** *J. Soil Conserv. Serv. N.S.W.* 4, 1948 (25-29).

A description is given of erosion-control measures adopted on an overstocked and overcultivated farm suffering from excessive run-off, gullyng and loss of fertility. The soils are red, sandy loams with granite outcrops, the average rainfall 23 inches per annum and the topography undulating. In addition to sowing lucerne with a cover crop of oats and grazing lightly, gullies were filled and pasture furrows, banks, grassed waterways, dams and absorption banks were constructed.

[1708] (944.9)631.459: 634.9
JOHNSTON, E. P. **Soil conservation and forestry in the Australian Capital Territory.** *Aust. Forestry* 10, 1946 (9-16). *For. Abs.* 9 (151).

Owing to the marginal climatic conditions for *Pinus radiata* it was essential to plough former grazing land in order to reduce competition from grass. Three furrows, not less than 9 inches deep, were ploughed along the contour for each row of seedlings. After the main area had been ploughed, two rows were ploughed along the banks of gullies, one turning the sod towards the gully, and a second along the ends of the rows turning the sod away from the gully and thus sealing the ends of the furrows. Before planting seedlings in ploughed lines it is necessary to break up the sods, and in order to check water flowing along the last furrow a spadeful of earth is placed in the furrow. A spadeful of earth on the windward side of the seedling also gives it some protection against the wind until it has become established.

[1709] (945)633.11-1.67
WATKINS, W. R. **Wheat production techniques. Can they be improved on the M.I.A.** *Farm. Newsletter* No. 14, 1947 (7-9).

Rice has during the past 22 years become the basic crop of almost all large farms under irrigation in the Murray Irrigation Area. Wheat is one of the few grain crops that can be incorporated into rotations with rice. Yields are, however, unsatisfactory compared with yields in surrounding dry districts. All stubble should as far as possible be returned to the soil. "Land grading" or smoothing the surface to eliminate low

portions is the basic principle and the governing factor of all crop production, including rice under irrigation. Compaction of the soil following sowing is essential on almost all M.I.A. soils.

[1710]

(961)631.4
SMYTHE, L. E. Soil science in Fiji.
Part I. *Fiji Agric. J.* 18, No. 3, 1947, pp.2.

INDEX TO AUTHORS

Abramova, M. M., 1402
 Adamson, N. J., 1702
 Afanasiev, M. M., 1588
 Aikman, J. M., 1632
 Allen, E. F., 1564
 Allison, F. E., 1533
 Anderson, A. J., 1580, 1581
 Antipov-Karataev, I. N., 1420,
 1459, 1655

Armero, L. de, 1697
 Arnold, H. C., 1582
 Atkins, I. M., 1692
 Aubréville, A., 1627

Baird, R. W., 1475
 Balchikova, N. P., 1423
 Baldwin, M., 1463
 Barbier, G., 1413
 Beadle, N. C. W., 1467, 1468
 Bear, F. E., 1579
 Beeson, K. C., 1583
 Belval, H., 1604
 Bergh, H., 1409
 Berwick, E. J. H., 1565
 Bétrémieux, R., 1675, 1676
 Bewlay, E. W., 1564
 Billings, I. K., 1618
 Biriukova, A. P., 1492
 Blandford, C. M., 1469
 Bogatyrev, K. P., 1397
 Bolyshev, N. N., 1460
 Bonnet, J. A., 1432
 Borchert, J. R., 1660
 Bordeleau, R., 1685
 Borden, R. J., 1598
 Boudru, M., 1401, 1636
 Bould, C., 1534
 Brandon, J. F., 1630
 Brenchley, W. E., 1465
 Brennan, E. G., 1514
 Brown, R. L., 1502
 Brown, W., 1639
 Bruin, P., 1521
 Brunson, A. M., 1560
 Bukoreshchliov, B., 1659
 Burger, H., 1628
 Burns, S. G., 1593
 Buzacott, J. H., 1599

Calma, V. C., 1571, 1572
 Campbell, R. B., 1440
 Cannon, H. B., 1643
 Carlson, R. F., 1540
 Carne, P. B., 1550
 Chabannes, J., 1413
 Chase, F. E., 1480
 Chastukhin, V. Ya., 1633
 Chernov, V. A., 1406
 Childers, N. F., 1610
 Choudhri, R. S., 1478
 Churchill, B. C., 1558
 Gibes, H. R., 1610
 Clark, K. G., 1527
 Clarke, G. B., 1454
 Clydesdale, C. S., 1593
 Cockbill, G. F., 1548

Cook, R. L., 1507, 1562
 Coulson, J. G., 1587
 Cox, M. B., 1476
 Crafts, A. S., 1552, 1553
 Cullity, M., 1539
 Curnow, D. H., 1574
 Curry, J. R., 1566

Dal, P. H., 1395, 1396
 Danilov, M. D., 1634
 Darrow, G. M., 1623
 Davis, C. M., 1703
 Davis, M. B., 1613
 Dawis, V. M., 1645
 Dean, L. A., 1511
 Derragh, L. F., 1688
 Dion, H. G., 1512
 Dobie, J. B., 1393
 Dobrzański, B., 1457, 1654
 Druif, J. H., 1701
 Dubois, C., 1672
 Dubois, G., 1672
 Duchaufour, P., 1631
 Duda, J., 1508
 Duley, F. L., 1496
 Dumo, V. I., 1495
 Dunne, T. C., 1559
 Dutt, A. K., 1458
 Dutta, S. K., 1498
 Dzetovetsky, V. V., 1472

Eaton, F. M., 1589
 Eaves, C. A., 1643
 Edmondson, W. T., 1506
 Edmondson, Y. H., 1506
 Eisenmenger, W. S., 1513
 Enders, C., 1425
 Enzie, J. V., 1695
 Ergle, D. R., 1589
 Esat-Kadaster, I., 1669
 Evans, A. C., 1545
 Eyer, J. R., 1695

Fenley, J. M., 1500
 Ferguson, W. G., 1578
 Filosofov, B. I., 1408
 Filutowicz, A., 1444
 Fishel, V. C., 1694
 Fleming, W. E., 1551
 Flint, L. H., 1488
 Forsyth, W. G. C., 1428
 Fraser, G. K., 1649
 Fraser, H. A., 1474, 1706
 Fujimoto, C. K., 1422
 Fullmer, F. S., 1519

Gaddy, V. L., 1533
 Gainey, P. L., 1481
 Gapon, E. N., 1452
 Gaucher, G., 1418
 Gavriluk, F. Ya., 1657
 Gericke, S., 1532
 Gołgbiowska, J., 1487
 Gorrie, R. M., 1477, 1503
 Gössl, V., 1535
 Gray, L., 1583

Greenwood, D. E., 1608
 Gries, G. A., 1640
 Grigsby, B. H., 1541, 1558
 Grossberg, J., 1509
 Gueit, M., 1547
 Guild, W. J. M., 1546
 Gupta, U. N. S., 1664

Hafenrichter, A. L., 1502
 Hamner, C. L., 1554
 Hamner, K. C., 1583
 Hanson, A. A., 1587
 Hardy, F., 1688
 Harley, J. L., 1485
 Harrison, R., 1490
 Hartley, C. W. S., 1568
 Harvey, D. G., 1515
 Hébert, 1682
 Hedlin, R. A., 1482
 Heidel, R. H., 1438
 Helrich, K., 1529
 Hendrickson, A. H., 1445
 Hepting, G. H., 1635
 Higbee, E. C., 1584
 Hill, H., 1613, 1614
 Holmes, A. D., 1641
 Horn, V., 1669
 Hutchison, C. B., 1696

Jacobson, H. G. M., 1411
 Jaeger, P., 1672
 Jansson, S. L., 1530
 Jayaraman, N., 1666
 Jenny, H., 1699
 Jensen, S. T., 1526
 Joachim, A. W. R., 1667
 Johnston, E. P., 1708
 Johnston, F. B., 1614
 Jones, H. E., 1555

Kaila, A., 1414
 Kandiah, S., 1667
 Kansu, S., 1669
 Katznelson, H., 1624
 Kellogg, C. E., 1394
 Kempianka, W., 1510
 Kendall, T. A., 1569
 Kennedy, W. K., 1575
 Kharitonov, G. A., 1494
 Kheifets, D. M., 1415
 Kiang Chi-Kien, 1554
 Kjaer, B., 1526
 Klychnikov, V. M., 1405
 Knowles, W. H. C., 1596
 Kocherina, E. I., 1451
 Kolesnik, I. L., 1449
 Kovda, V. A., 1493
 Krimgold, D. B., 1446
 Krishna, P. G., 1462
 Krzyszkowski, J., 1400

Laatsch, W., 1427
 Labis, F. L., 1645
 Lajudie, J., 1479
 Landmark, K., 1430
 La Touche, C. J., 1486

Lawrence, A. O., 1466
 Lee, Shu-Tan, 1661
 Lemmermann, O., 1429
 Lemoyne, S., 1604
 Le Riche, F. J. H., 1531
 Lewis, C. C., 1513
 Lhuillier, 1676
 Linehan, P. A., 1650
 Linkola, H., 1484
 Livera, E. J., 1668
 Loustalot, A. J., 1585
 Love, K. S., 1527
 Lucas, R. E., 1524
 Ludorf, R., 1678

McCalla, T. M., 1453
 McCollam, M. E., 1519
 McConaghy, S., 1650
 McEvoy, E. T., 1605
 MacEwan, D. M. C., 1403
 McFadden, E. S., 1692
 MacGregor, N. M., 1498
 McHatton, T. H., 1615
 Mackenzie, A. J., 1511
 Mackenzie, R. C., 1404
 Maksimiuk, G. P., 1437
 Marloth, R. H., 1617
 Marshall, F. R., 1570
 Martin, J. T., 1549
 Martin-Leake, H., 1523
 Massibot, J. A., 1619
 Masson, H., 1497
 Meadly, G. R. W., 1542
 Mimms, O. L., 1646
 Minshall, N. E., 1473
 Mitchell, R. L., 1419
 Moffett, A. A., 1607
 Molina, J. S., 1455
 Montgomery, N., 1639
 Morani, V., 1407
 Morris, H. E., 1588
 Moulton, J. E., 1540
 Mumford, D. C., 1577
 Musierowicz, A., 1400, 1417
 Mynhardt, C. B., 1680

N(—), G. W., 1679
 Némec, A., 1629
 Newton, J. D., 1482
 Nicholas, D. J. D., 1442
 Nicholas, H. T., 1707
 Niklewski, B., 1510
 Nilsson, F., 1638
 Nolla, J. A. B., 1600
 Nutman, P. S., 1483

Obolenskaia, L. I., 1421
 Ogg, W. G., 1651
 Olson, L. C., 1431
 Orchard, E. R., 1678
 Orchard, H. E., 1543
 Orr, J. B., 1464

Paauw, F. van der, 1412
 Palis, G. T., 1571
 Palmer, V. J., 1476

Panella, A., 1601
 Peikert, F. W., 1507
 Perumal, S., 1462
 Petrov, B. F., 1663
 Pinck, L. A., 1533
 Pochon, J., 1479
 Poggendorff, W., 1704
 Polynov, B. B., 1491
 Ponomareva, V. V., 1426
 Popovsky, A., 1670
 Portères, R., 1461, 1674
 Potter, J. A., 1689
 Poulsen, J. F., 1528
 Presniakova, G. A., 1671
 Preston, R. J., Jr., 1630

Quevedo, C. V., 1563

Rader, L. F., Jr., 1517
 Ranghel Galindo, A., 1700
 Raymond, L. C., 1587
 Reade, M., 1512
 Regnier, R., 1547
 Reiber, H. G., 1553
 Richards, L. A., 1440
 Richardson, L. T., 1624
 Rickson, J. B., 1436
 Rico, S. G., 1572
 Riemen, W., 1529
 Riera, A., 1432
 Roach, W. A., 1443
 Robertson, L. S., 1562
 Rode, A. A., 1489
 Rogers, C., 1641
 Rogers, L. H., 1516
 Rolley, 1676
 Ross, A. A., 1705
 Ross, D. M., 1548
 Rossiter, R. C., 1574
 Roth, E. R., 1635
 Roulet, M. A., 1398
 Rowaan, P. A., 1521
 Ruggieri, G., 1616
 Russel, J. C., 1496
 Russell, M. B., 1575
 Rut, W., 1417

Sajdel, A., 1592
 Sale, G. N., 1501
 Salgado, M. L. M., 1620, 1621, 1622
 Satyanarayana, K. V. S., 1665
 Sayre, C. B., 1586, 1642
 Scharrer, D. K., 1505
 Schofield, J. L., 1576
 Scholl, W., 1690
 Schroeder, W. T., 1647
 Scott, C. E., 1520
 Scott, W. A., 1606
 Seeley, J. G., 1648
 Sen, A., 1664
 Shaulis, N., 1626
 Sherman, G. D., 1422
 Shive, J. W., 1514
 Sidorov, I. S., 1424
 Sievers, A. F., 1611
 Sigurdsson, S., 1425

Simpson, H. J., 1568, 1569
 Sims, H. J., 1471
 Slater, C. S., 1450
 Smith, A. L., 1591
 Smith, E., 1411
 Smith, G. M., 1560
 Smythe, L. E., 1710
 Sokolova, E. I., 1656
 Soper, J. R. P., 1570
 Sozański, S., 1439
 Spaini, L. S., 1455
 Spencer, D., 1580
 Spinks, J. W. T., 1512
 Spirhanzl, J., 1410
 Stahler, L. M., 1544
 Stanganelli, M., 1456
 Stapledon, R. G., 1499
 Stapley, J. H., 1548
 Stevenson, E. S., 1611
 Stevenson, W., 1538
 Stewart, A. B., 1518
 Stewart, R. H., 1650
 Stobbe, P. C., 1683
 Stone, N. E. van, 1556
 Strádal, V., 1653
 Stroganov, B. P., 1590
 Strugger, S., 1441
 Stumpel, J. M. H., 1603
 Sudres, A., 1673
 Swaminathan, K., 1665
 Swanson, C. L. W., 1411

Tapke, V. F., 1557
 Taylor, T. P., 1470
 Telford, E. A., 1585
 Terlikowski, F., 1439, 1444
 Thomas, H. L., 1577
 Thomas, H. R., 1644
 Thomas, P. H., 1609
 Thompson, H. A., 1597
 Thorp, J., 1463
 Throssell, G. L., 1559
 Tims, E. C., 1637
 Tisdale, E. W., 1684
 Toole, E. R., 1635
 Toth, S. J., 1579
 Tyson, Smith, C., 1641

Ukil, A. C., 1664
 Underwood, E. J., 1574
 Utescher, K., 1522

Válek, B., 1652,
 Veihmeyer, F. J., 1445
 Verburgt, J. W., 1603
 Vettori, L., 1433
 Vicente, J. G., 1435
 Vidal, R., 1619
 Villeneuve, G. O., 1686
 Vinogradov, A. P., 1416
 Virtanen, A. I., 1484
 Viswa Nath, B., 1665
 Vittum, M. T., 1642

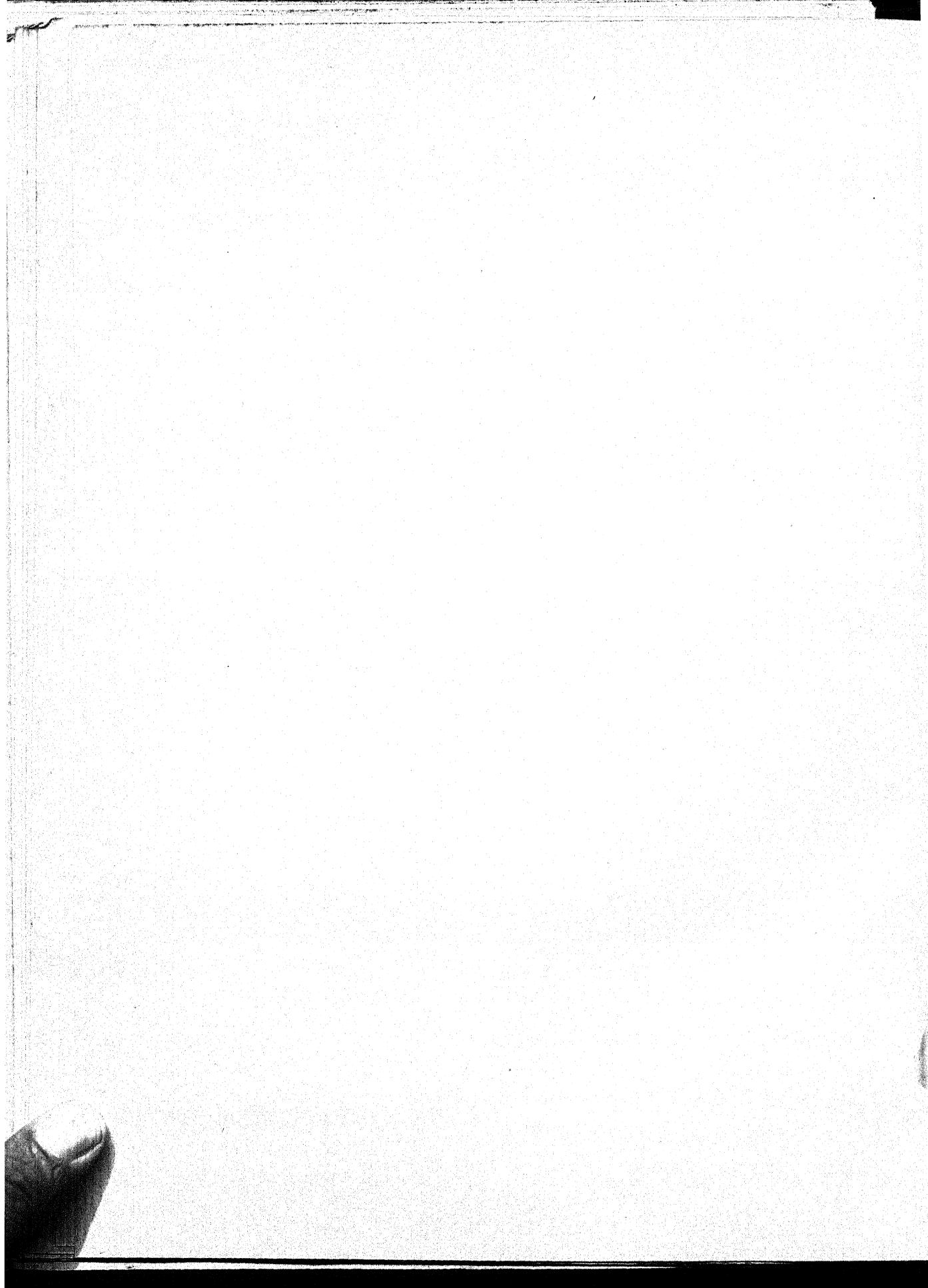
Waldo, G. F., 1623
 Wallace, A., 1579

Wallace, H. M., 1690
 Wang, W. T., 1662
 Watkins, W. R., 1709
 Whitford, P. B., 1693
 Wilcox, L. V., 1537
 Wilde, S. A., 1693
 Williams, O. G., 1504
 Williams, R. F., 1399

Wilson, J. K., 1478
 Wojciechowski, J., 1510
 Wondrausch, A., 1400
 Woodruff, C. M., 1434
 Wu, C.-H., 1516
 Yankaviev, K. P., 1658
 Yee, T. Y., 1527

Young, V. D., 1447
 Youngberg, C. T., 1693

Zaumeyer, W. J., 1646
 Zemla, L., 1439
 Zonn, S. V., 1448
 Zuev, L. A., 1452



SOILS AND FERTILIZERS

Vol. XI

1948

No. 6

PARTIAL STERILIZATION

The ultimate beneficial effects on plant growth of steaming soil or treating it with certain volatile organic compounds have been known for many years. The various treatments are commonly referred to as "partial sterilization", though it may be questioned whether sterility is a condition that can be partially attained. Certain it is, however, that the various processes of so-called partial sterilization must and do have an immediate effect on the biological population of the soil. The processes appear to be exceedingly complex, and it has not yet been found possible to unravel them. Indeed, if we judge by the relative paucity of current literature on the subject, compared with the output of twenty or thirty years ago, it would seem that research workers are giving up the attempt as impossible with present techniques. It may be useful to summarize the few known facts that have been established about partial sterilization and some of the more probable theories that have been put forward to explain them.

The main effect observed after treatment with steam or antiseptics (which include formaldehyde, carbon disulphide, toluene and chloropicrin) is a marked initial accumulation of ammonia in the soil, accompanied by a cessation of nitrification which, however, is subsequently stimulated. There is also an immediate inhibition of germination and a retardation of plant growth followed after some weeks by greatly increased growth. Darbishire and Russell⁽³⁾ stated that steam or antiseptic treatment greatly increased the oxidizing power of the soil, as indicated by oxygen absorption.

Waksman⁽²⁶⁾ lists the following theories that have been put forward to explain the increase in productivity:—

- (1) Direct stimulation.
- (2) Indirect stimulation by bacteria. Organic matter is made more available

for bacterial action by, e.g., the removal of fatty material, or increased solubility of carbohydrates, nitrogen and phosphorus compounds, by the killing of fungi, protozoa, etc., the bodies of which are then decomposed by bacteria.

- (3) A change in the microbial equilibrium.
- (4) Destruction of protozoa, removing a factor limiting bacterial development.
- (5) Destruction of toxins.
- (6) Destruction of pathogenic bacteria and fungi.
- (7) Increased nitrogen fixation. There seems, however, to be no evidence in favour of this.

Russell and Hutchinson⁽²⁴⁾ state that there is an important difference in the effect of heat and antiseptics on nitrification. Both methods destroy the nitrifying organisms, but when the organisms are reintroduced into heat-treated soil they do not develop immediately (as they did in toluene-treated soil), indicating that the heat treatment had brought about some lasting change in the physical habitat.

Effects on physical and chemical properties. Other workers subsequently showed that steam treatment reduced the water-holding capacity^(18, 19). Malowany and Newton⁽¹⁶⁾ showed that steam-treated soils often had about 1% lower water capacity than untreated soils, but not always. Wilson⁽²⁸⁾ found an increase in the amount of water absorbed by oven-heated soil. Herzog⁽⁵⁾ found that steaming reduced the water-holding capacity of alkaline soils, but increased it in other soils.

Malowany and Newton⁽¹⁶⁾ also showed that the capillary rise was lower in sterilized than in unsterilized soils. Gifford, quoted by Newhall⁽¹⁸⁾, attributed this to destruction

of the colloidal films connecting the soil particles. Egorov⁽⁴⁾ found that carbon disulphide also reduced capillary rise as well as water-holding capacity.

Malowany and Newton⁽¹⁶⁾, and Millikan⁽¹⁷⁾ found that steam sterilization had no effect on the pH of soils, but Schreiner and Lathrop⁽²²⁾ found an increase in titratable acidity when a soil was steamed for three hours at 135°C.

Other physical properties said to be affected by steaming are sticky point (lowered)⁽¹⁶⁾, shrinkage (increased)⁽¹⁶⁾ and freezing point (lowered)⁽²⁾. Laurie⁽¹³⁾ stated that steaming conferred a granular structure on the soil, but Herzog⁽⁵⁾ found that the structure of heavy soils poor in humus appeared to deteriorate after steaming. She attributed this deterioration to the lack of humus.

Koch⁽¹⁰⁾ found that both steaming and treatment with formalin increased the concentration of the soil solution, the increase being greater with steam than with formalin treatment. Kelley and McGeorge⁽⁸⁾ showed that steaming increased the solubility of soil constituents, especially of Ca, Mg, Mn and P₂O₅, and to a lesser extent of K, Si and Al. The solubility of Fe was generally lower. Millikan⁽¹⁷⁾ found higher concentrations of Ca, P, K, Mg, Zn, Mn and Cu in plants grown on sterilized soil, and a decrease in Fe concentration.

Toxic effects. The retardation of germination was attributed by Pickering⁽²⁰⁾ to certain nitrogen compounds produced by the decomposition of organic matter by heat. He found that productivity was increased when soils were heated below, and decreased when they were heated above, 100°C.

According to Russell and Petherbridge⁽²⁵⁾ steam sterilization or heating soil to 100°C. causes an initial temporary retardation of germination and toxicity to plant growth. Heating soil to 55°C. rarely causes retardation of growth, and retardation after treatment with antiseptics occurs only on very rich soils. Toxicity to seed germination is not always related to toxicity to plant growth⁽⁶⁾. When heated soil is kept moist the toxic property gradually disappears, but seems to

be retained indefinitely when the soil is kept dry. Schreiner and Lathrop⁽²²⁾ isolated dihydroxystearic acid from a steam-treated soil and thought that this might be the injurious agent. Guanine and arginine have also been reported in sterilized soils. Johnson⁽⁶⁾ suggested that excessive ammonia might be the cause of toxicity, but Robinson⁽²¹⁾ stated that the amount in steam-treated soils (ca. 40 lb. per acre) was well below the toxic concentration (330 lb. per acre). Inoculation of heated with unheated soils shortens the duration of the inhibitory effect.

Applications of phosphate largely counteract the injurious effects of partial sterilization^(14, 21).

Tam and Clark⁽²³⁾ found that chloropicrin and formaldehyde treatment stimulated early rapid elongation of the roots of pineapple plants, whereas steam treatment depresses root development during the first eight weeks of plant growth. After 43 weeks, however, plants in steam-heated soil had developed the best root systems. Treatment with formaldehyde after steam reduced the early toxic effect of the steam treatment, but treatment with chloropicrin appeared to increase it.

In general, Gramineae are tolerant of the toxic agent, and Solanaceae and Leguminosae are sensitive to it⁽⁷⁾. It may be noted that Darbishire and Russell⁽³⁾ stated that the Leguminosae are the only class of plant that does not respond favourably to partial sterilization.

Increased productivity. The beneficial effect on plant growth has been likened to the effect of a fallow^(5, 17) or of nitrogenous manuring, Liebscher⁽¹⁵⁾. Koch⁽⁹⁾ thought that the effect of antiseptics was a physiological stimulation of the plant roots. Russell and Hutchinson⁽²⁴⁾ showed that in both toluene- and steam-treated soils there was a small immediate production of ammonia, then after a few days a period of strong ammonification followed by a decline. Accumulation of ammonia was greater than could be accounted for by cessation of nitrification. Very high numbers of bacteria occurred in partially sterilized soils, but

these numbers were reduced when partially sterilized soil was inoculated with untreated soil. Russell and Hutchinson (*loc. cit.*) considered that many of the phenomena of partial sterilization could be explained by postulating a factor, not bacterial, which limited the development of bacteria and was destroyed by partial sterilization. They suggested that this factor might be the soil protozoa, but recognized that other factors might also be operative. Waksman⁽²⁶⁾ states that spore-forming bacteria (ammonifiers) are resistant to partial sterilization and may develop abundantly afterwards, whereas non-spore formers (nitrifiers) are very sensitive, but afterwards multiply rapidly.

No conclusive evidence has been obtained that Russell and Hutchinson's protozoa theory is correct. Kopeloff and Coleman⁽¹²⁾ pointed out that it ignored the considerable ammonifying activities of fungi, and Waksman and Starkey⁽²⁷⁾ that the activities of ammonifying fungi might also be increased by partial sterilization. Koffmann⁽¹¹⁾, using a direct method of counting soil protozoa, concluded that the number and volume of bacteria in soil were so great relative to those of protozoa that the protozoa could have no important influence on the bacterial population or explain the sharp rise in ammonia production. Waksman and Starkey pointed out that fungi normally use up large amounts of nitrogen as microbial protein, and their almost complete destruction by partial sterilization would make their body substance available as sources of energy for other micro-organisms and ultimately for plants. Fungi re-introduced into heat-sterilized soils make very rapid growth.

Malowany and Newton⁽¹⁶⁾ showed that accumulation of ammonia and increase in water-soluble phosphate and nitrification were greatest in soils rich in organic matter.

Another hypothesis, put forward originally by Darbishire and Russell⁽³⁾ is that partial sterilization removes organisms which, without benefiting the plant, compete for the plant food present in the soil, so that when they are killed a larger amount of food is available to the plant. They recognized, however, that it was difficult to reconcile this hypothesis with the increased absorption

of oxygen by partially sterilized soils. Bolley⁽¹⁾ suggested that the destruction of parasitic organisms by partial sterilization might be a factor in the increased productivity of the soil. Millikan⁽¹⁷⁾ has recently stressed (1) the possible effect of partial sterilization in destroying the pathogenic fungi and bacteria and thereby increasing plant growth, and (2) its effect in increasing the availability of plant nutrients, both by autolysis of microbial protoplasm and by reducing microbial competition for nutrients. The possibility of saprophytic soil fungi and bacteria rendering mineral nutrients unavailable has recently been recognized. Deficiencies of manganese, copper and zinc have been removed by partial sterilization. Millikan also likens the effect of partial sterilization to that of fallow in that in fallow soil there is a reduction in the numbers of living micro-organisms present compared with those in cropped soils, and a smaller quantity of plant nutrients locked up in the thallus of the micro-organisms.

SUMMARY

Treating the soil with heat or antiseptics improves the vigour of plants and increases crop yields, the effect of antiseptics being milder than that of heat and approximating the effects of heating to about 50-60°C. Steam heating the soil at about 100°C. alters the physical properties of the soil and causes initial retardation of seed germination and/or of plant growth. This retardation can often be prevented or reduced by heavy applications of phosphate or by the use of formaldehyde after steam and the factor producing it disappears in moist soils, but is preserved indefinitely in dry soils. The effects of steam treatment are more pronounced on soils with a high organic content.

Various theories have been put forward to account for the phenomena resulting from heating the soil and treating it with antiseptics, such as Koch's stimulation effect, Russell and Hutchinson's protozoa theory, which involves an inhibitory factor destroyed by the treatments, and Hiltner and Störmer's microbiological equilibrium theory.

The latest suggested explanation is that the destruction of parasitic organisms in the

rhizosphere not only destroys possible disease-causing organisms but also releases plant nutrients, as the parasitic organisms, it is suggested, are also saprophytes and compete with the plants for available nutrients, and their autolysis releases further nutrients stored up in their thallus. The

approximation of the effect of steam heating with that of bare fallow is further borne out by the fact that the treatment is more effective on stubble than on a bare fallow. The effect of antiseptics is considered to resemble that of N fertilization.

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THE LIME REQUIREMENT OF SWEDISH SOILS

(*Den svenska åkerjordens kalkbehov. By A. Åslander. Lantbruksförbundets Tidskriftaktiebolag, Stockholm. 1948, pp. 447*).

With a view to correcting over-emphasis on the value of liming sometimes propounded in agricultural literature, the author has tested the general applicability of his theory that most of the acid arable soils in Sweden, not being deficient in calcium, are capable of giving satisfactory crop yields provided a sufficiently high available-nutrient level can be maintained. The book presents the results of about a hundred liming trials under varying conditions of humidity and representing many soil types. The experiments differ from the usual liming trials in two respects. Instead of using fixed quantities of lime, the rates of dressing were varied from centre to centre so as to provide the same fractions of the total lime requirement of the soil. This would have afforded a satisfactory basis for comparing effects on different soils were it not for the fact that values obtained by any analytical method depending on the amounts of lime needed to raise the soil reaction to pH 7.0 cannot be applied directly to field conditions without using varying and arbitrary factors. With some acid soils it is difficult to raise the pH much above 6.0 even by additions of lime exceeding those likely to be used in farm practice. Whilst in the past little attention has been paid to basal dressings in liming trials, the present work emphasises the importance of evaluating the effect of liming at levels of available nutrients both for acid and neutral soils. None of the soils used in the investigation was potash-deficient. It was found very difficult to raise the available phosphate level on the acid soils to that on the neutral soils. By incorporating superphosphate with farmyard manure instead of applying it separately it was possible to protect the phosphate from too rapid fixation. Since raising the fertility levels of the acid soils by a so-called "standard fertilization" dominates the design of the experiments and the evaluation of the liming effects, it is to be regretted that beyond mechanical analyses and determinations of soluble nutrients in soil extracts at pH 3.5, no details are given as to how the "standard fertilization" was settled for the

individual soils. The basal dressings were apparently adjusted so as to ensure satisfactory yields on control plots.

The investigation includes a number of aspects of the liming problem such as the effects of lime on yield, chemical composition and nutritive value of crops, and the botanical composition of leys. The main conclusions on yield increases can be summarized by stating that the effects were small when "standard fertilization" was used except on some very acid "gyttja" soils and some "alun" soils. The author emphasises, however, that liming may have indirect effects independently of pH by accelerating the decomposition of organic matter and thus liberating nitrogen, which on some neutral soils may result in large yield increases. Whilst liming has sometimes given only small effects on acid soils which have been well manured in certain wetter parts of the United Kingdom, it must be emphasised that the results of the Swedish experiments presented here cannot be regarded as being of general application, since the crops tested were mostly the less sensitive ones, such as wheat, potatoes and oats. Only comparatively few, about 10 out of some 200 tests were on such sensitive crops as barley. The conclusions would probably have been modified considerably if the experiments had included more than a single trial on sugar beet.

The value of the book lies in the salutary emphasis on the danger of judging lime requirement from either a single value of pH or readily soluble calcium without due regard to the general fertility level of the soil. The advocacy of liming to any pH regarded as optimal is as yet without sufficient foundation, and the author has shown that for some of the less sensitive agricultural crops better methods of maintaining available nutrients, particularly phosphate, would save unnecessary expenditure on liming.

SIGNE G. HEINTZE

SUMMARY OF REPORTS

Reports received include : *Australia*, Report of the Council for Scientific and Industrial Research 1946-47; Reports of the Soil Conservation Service of New South Wales 1945-46 and 1946-47; Report of the Department of Conservation of New South Wales 1946-47; *British West Indies* Sugar Association, Reports on Research Work 1947; *Canada*, Department of Agriculture Dominion Reclamation Station, Melita, Manitoba, Progress Report 1936-47; National Resources Council of Canada Report 1947-48; British Columbia Department of Lands and Forests, Report of the Forest Service 1947; *Ceylon*, Report of the Director of Agriculture 1946 IV.D; Annual Report of the Coconut Research Scheme, Ceylon 1946; *Colonial Office*, Colonial Annual Report 1947 for Barbados; *Cyprus*, Department of Agriculture Report 1947; *Eire*, Report of the Minister for Agriculture 1946-47; *France*, Recherches sur la fertilisation effectuée en 1947 par les Stations Agronomiques; *Gold Coast* Report on the Geological Survey Department 1946-47; *Holland*, Landbouwproefstation en Bodemkundig Instituut T.N.O. Groningen 1947; *India*, Department of Agriculture, Bombay Province, Season and Crop Report 1945-46; Tocklai Experiment Station, Indian Tea Association Report 1947; *Long Ashton* Agricultural and Horticultural Research Station Report 1947; *Morocco*, Rapport d'activité du centre de Recherches Agronomiques 1941-47 and 1947; *New Zealand* Department of Scientific and Industrial Research Report 1947; Cawthron Institute Report 1947-48; *Northern Ireland*, Agricultural Research Institute Report 1947-48; *St. Vincent* Agricultural Department Report 1947; Report on *Singapore*, 1947; *Trinidad*, Imperial College of Tropical Agriculture, Report of the Governing Body and Principal's Report 1947; *Uganda* Geological Survey Department Report 1945; *West African* Cacao Research Institute, Tafo, Report 1946-47; *United States Experiment Stations*, *Alabama* 1945-46; *Delaware* 1946-47; *Michigan* 1946-47; *Wyoming* 1946-47.

Australia.—*Council for Scientific and Industrial Research.*—Effect of major and trace elements on establishment and yield of grass-subterranean clover pasture. Poor

development of lucerne may be due not to deficiency of any major or trace element, but to excess of Mn in the soil. Lack of response by pasture species to super. Relationship between mineral status of the soil and climax vegetation in savanna woodland and dry forest. Establishment of *Wimmera* ryegrass under a cereal cover crop. P and K deficiency studies with subterranean clover, and responses to Mo. Cu-dressed pastures and grazing trials. Dressings of CoSO_4 for Co-deficient pastures. Experiments with soil fumigants for weed eradication. Fertilizer experiments in pine plantations; applications of super. increased growth rate and lessened "needle-fusion" symptoms.

Soil surveys in South Australia, Victoria, Tasmania, Western Australia, New South Wales and Northern Australia. Studies of soils associated with toxæmic jaundice of sheep. Soil structure and effect of wheat-fallow rotation. Studies on X-ray diffraction, movement of water in soil, electrical measurements of water content and temperature of soil. Soil-bacteriological investigations on the possible influence of Mo on N fixation by *Rhizobium* in association with a leguminous plant. The viability of *Rhizobium* in soil and dust. Investigations on irrigation, reclamation, drainage and land use; soil reconditioning in orchards; salting in orchards; monthly records of composition of drainage waters pumped from deep sand beds. Frost survey in Murrumbidgee irrigation area. Manurial trials on citrus and sultanas. Fe chlorosis investigations on currants.

New South Wales Soil Conservation Service.—Coastal sand-dune stabilization. Roadside erosion control. Wind erosion in marginal wheat lands. Catchment-area protection.

New South Wales Department of Conservation.—Decentralization of activities by appointment of six district conservationists and establishment of a number of sub-districts. Roadside erosion and sand-dune control. Regional development and water conservation in coastal river valleys.

British West Indies Sugar Association.

—Cultivation and drainage experiments on soils of poor tilth in flat areas. Spacing trials. Trials with lime, N, P and K in British Guiana, Barbados, Jamaica, Trinidad and Antigua. Long-term effects of $(\text{NH}_4)_2\text{SO}_4$ on crop yield and quality. Effects of ground limestone and fallowing in conjunction with $(\text{NH}_4)_2\text{SO}_4$. Comparison of $(\text{NH}_4)_2\text{SO}_4$, NaNO_3 and KNO_3 as fertilizers. Effect of size of dressing of N on gain from P and effect of P on gain from K. Experiments with N and P on Frontland soils and Riverside soils of British Guiana. Trials with NPK on black soils of Barbados. Trials with pen manure, mulching, molasses and green manures. Use of Sudan grass, tomatoes and maize as indicator plants for manurial requirements of sugarcane.

Canada.—*Dominion Reclamation Station, Melita, Manitoba.*—Experiments on erosion control with strip farming, trash cover, autumn spreading of straw, binder stubble and combine stubble, surface tillage and ploughing, and basin listing. 2-8-year crop-rotation studies. Trials with manure and commercial fertilizer for wheat, oats, maize and barley; renovation of old stands of brome grass and lucerne. Comparison of effect of various grasses and legumes on yields of subsequent grain crops and on the physical and chemical composition of the soil. Sweet clover as a green manure. Herbicides for weed control. After-harvest tillage for weed control. Couch-grass eradication.

British Columbia Department of Lands and Forests.—Study of nursery-soil fertility and influence of NPK fertilizers on seedling growth.

Ceylon.—*Report of Director of Agriculture.*—Investigations of physical and physico-chemical properties of the major soil groups of Ceylon. Study of trace elements, especially Mn. Fixation and availability of phosphates in Ceylon soils; fixation of P by laterite and lateritic soils is very high and extremely high dressings of P are required. There appears to be a fairly high negative correlation between the silica/alumina ratio of the clay fraction and the fixing power of soils for P. Investigation of the effect of liming on availa-

bility of P. Relationship of pH and salt content to crop performance. Study of citrus soils inadequately supplied with lime. Investigation of crop failures due to salinity or alkalinity, defective drainage, K deficiency on tobacco soils, high organic acidity or poor nutrient status. Investigations of the suitability of manuring with bone meal, paddy manure mixture, cinnamon ash, Maldivian fish dust, animal meal, bat guano and waste leather. Effect of lime and P fertilizers on fodder and pasture. Beneficial effect of injecting ammonia into irrigation water for paddy.

Coconut Research Scheme.—Field experiment with NPK. 10 years' experiments on manuring with N show increase in yield of copra, but a rapid fall in response after the fifth year. Manuring with K increased the K content of milk of coconuts; increase of N manures depressed K content of milk; P manures showed no difference in yield or in K content of milk.

Cyprus.—Trials with fertilizers, rotations and fallows for cereals. Comparison of green manure and bare fallow and their effect on soil moisture and available N. Establishment of Soil Conservation Service. Fertilizer trials with grapes and potatoes. Investigation of Cl content of irrigation waters and of soils irrigated with them, and the growth of cereals, cotton, lucerne, vegetables, potatoes and olives.

France.—*Amiens.*—Effect of NPK on potatoes and sugar beet. Soils of the Santerre and Vermandois. *Antibes.*—Effect on potatoes of mineral and organic fertilizers. Effect of DDT and hexachlorocyclohexane on soil micro-organisms. *Avignon.*—Application of Chaminade's method of estimating organic matter to calcareous soil with high and low organic-matter content. *Blois.*—Determination of the amount of lime liable to induce chlorosis in pear and apple trees. Rate of decomposition in soil of straw, lucerne, leaves and peat. Effect of MgO on potatoes. Manuring of asparagus. Fertilizer injection of apples, pears and grapes. *Chartres.*—Comparison of green manure and farmyard manure on a wheat-oats-potato rotation; comparison of farmyard manure, straw and peat on a potato-wheat-oats-potato rotation. Variations over 4 years in the humus content

of soil planted with lucerne. Rate of decomposition of humus in bare soil and of straw and lucerne in soil in pots and in the field. Exhaustion of soil reserves and effect of PK, with lucerne as a crop. Determination of the optimum dose for potatoes of mineral N in one and two applications. *Chateauroux*.—Effect of N and P on sunflowers and of N on poppies. Cultural methods for barley. *Clermont-Ferrand*.—N deficiencies in apple orchards. Fertilizers for rye and potatoes. *Montpellier*.—Effect of P fertilizers on the total-, lipid-, mineral- and protein-P content of grasses and legumes. *Nantes*.—Residual effects of NPK. *Quimper*.—Effect of NPK on potatoes. K deficiency as the probable cause of "bigarrure" in potatoes. *Rouen*.—Manuring and weed control for pastures. *Toulouse*.—Existence of two states of water-soluble P in super. Manuring of peach trees. *Versailles*.—Lysimeter experiments; comparison of effect of bare and cultivated soils and of organic-matter additions on yield, water regime and loss of mineral nutrients. Effect of additions of clay on the P nutrition of plants in culture solution. Low temperature synthesis of antigorite. Examination of tropical-soil clays. Formation of a phyllite by treating montmorillonite with 20% CaCl_2 or MgCl_2 . Differential thermal analysis of clays. Extraction of exchangeable K by means of NH_4 acetate. Function of exchangeable cations in the absorption of anions by clays. Relationship between anion absorption by clays and their flocculation. Reversibility of P fixation. Differences between the absorption of phosphates by soil clays and by mineral clays. Fixation of As by soils. Effect of humus on P fixation in soils, including lateritic soils. Methods of applying fertilizers to potatoes. K deficiency in apple trees. Roach method for diagnosing mineral deficiency in plants. Manuring of poppies. Silico-mineral complexes and their possible application to agriculture.

Holland.—*Landbouwprefstation en Bodemkundig Instituut, Groningen*.—Soil-structure investigations; visual estimations in the field and aggregate analyses; effect of artificial pastures, green manuring and stable manure; relationship of structure to potato yields; pore distribution and total pore volume. Granulometric studies by means of macro- and micro-pipette methods and the Sharples

centrifuge. Mineralogical and X-ray examination of clays and of a heath podzol. Effects of lime, Mg limestone and P on sandy soils; effect of gypsum on exchangeable-base content of inundated soils. Root studies in grassland and in arable land cropped with potatoes, rye and sugar beet. Use of straw for hot beds. Storage of stable manure to minimize losses. N losses in acid soils during nitrification; effect of household-refuse compost on soil micro-organisms. Formation and decomposition of soil-organic matter in grassland.

Indian Tea Association, Tocklai Experiment Station.—Comparison of effect of annual applications of cattle manure and $(\text{NH}_4)_2\text{SO}_4$ on the yield of tea on sandy soil. Comparison of effects of N, P and K singly and in combination on the yield and quality of low-yielding tea. Use of weedkillers in tea and on grazing lands. Effect of shade trees on N, P and K manuring. Effect of NPK fertilizers on dark- and light-leaf jats.

Long Ashton.—Management and cropping of blackcurrant plantations. Control of Mg deficiency of apples by soil dressings, solid injections and foliage sprays. Comparison of effects of dung, compost and inorganic fertilizers on crops and soil and their effect on Mg deficiency. Technique for study of Mo deficiency in plants. Soil acidity and the relative effects of Al and Mn toxicities on farm and market-garden crops. Effects of lime and fertilizers on potatoes on a strongly acid soil reclaimed from heath. Use of *Aspergillus niger* in the bio-assay of Mg, Cu, Zn and Mo in soils. Effect of manuring on quality of potatoes.

Morocco.—Soils of the extreme south of Morocco. Experimental study of effect of irrigation on the soils of Beni-Amir. Classification of Moroccan soils for the preparation of a soil map on scale of 1:200,000. Influence of soil on composition of maize.

New Zealand.—*Department of Scientific and Industrial Research*.—Mapping of types of soil erosion in southern half of North Island. Application of X-ray techniques and of differential thermal analysis to the study of clay minerals. Investigations into genetic differences in the yellow-earth group of soils.

Correlation between corrosion of iron pipelines and analytical tests of soil acidity, resistivity, differential aeration, moisture-holding power and the presence of aerobic bacteria in the soil. Chlorosis of apple and peach trees due to overliming. Relationship of boron to yellow-leaf of flax. Study of total soil porosity and non-capillary porosity of pasture and cultivated soils. Measurement of permanent wilting point of soils by the freezing-point depression method. Investigations of B deficiency and the uptake of B. Use of Virginia stock as an indicator of available lime in soil.

Cawthron Institute.—Effect of steam and soil disinfectants on the plant-food status of tomato soil. Effect of fertilizers on the chemical composition of apple-tree fruit and leaves after manuring in different ways for 16-20 years. Chlorosis of apple trees due to Fe deficiency and abnormal soil moisture during unusual weather. Mg, Zn and Mn deficiency of apple trees. Fertilizers for raspberries. Effect of cocoa-bean husks, compost, sawdust and charcoal on tomato yield. Reduction of hard-core in tomatoes following the application of chloropicrin as soil disinfectant. Hard-core was least in soils where exchangeable K was high and exchangeable Mg was low. Effect of fertilizers on the chemical composition of tobacco. Use of steam sterilization and chloropicrin for the control of black root-rot in tobacco seedlings.

St. Vincent.—Yield increase of arrowroot from applications of $(\text{NH}_4)_2\text{SO}_4$ and decrease from P applications; no response from K. Investigation of the residual effect of fertilizers on sweet potatoes and yams. Study of the effects of crop sequence, weed fallowing, green manuring and catch cropping on yields of food crops and cotton and on soil fertility.

Trinidad, Imperial College of Tropical Agriculture.—Investigations by laboratory methods of soil genesis have been extended to sugar-cane soil types of British Guiana. Investigations of movement of rain water

falling on typical sandy and clayey sugar-cane soils. Mulching experiments on cacao and studies of cacao-soil deterioration.

West African Cacao Research Station, Tafo.—Preliminary soil survey of forest areas of Gold Coast, Togo, Nigeria and British Cameroons. Methods of reconnaissance and detailed soil surveys are described. Good and bad cacao soils are distinguished. NPK trials on young cacao.

United States Experiment Stations.—

Alabama.—Effect of lime on K requirement of cotton. Importance of fineness of ground limestone. B requirements of lucerne. Effect of sources of N on soil reaction, organic matter and exchangeable ions. Effect of legumes and fertilizer treatment on yield and on N content of soils. Residual value of stable manure, vetch and NaNO_3 . Erosion control in orchards. Influence of lime and different rates of N, P and K on growth cracks in sweet potatoes.

Delaware.—Effect of different fertilizer applications on green-manure crops and on yield of maize. Orchard-soil management for apples with mulch of straw, chicken manure, NaNO_3 , soybean cover crop and complete fertilizer.

Michigan.—Chemical weed control. Study of soil moisture and method for measuring moisture and temperature in soils. Soil treatments and soil conditions affecting growth, yield and quality of beans and sugar beet. Studies in base-exchange properties of some Michigan soils. Effect of mulching materials on orchard soils. Relationship between K supply and growth of lucerne and other legumes. Effect of K and Mg on yield and set of fruit on tomatoes, sugar beets and cucumbers. Use of tillage methods for preparing seedbeds.

Wyoming.—Toleration by plants of relatively large amounts of organic Se in the soil. Experiments on irrigation of lucerne weekly, two-weekly and as needed; overgenerous irrigation reduced potato yields.

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages. Where the Bureau has only seen an abstract, and not the original paper, no language indication is given.

Original (untranslated) titles of papers are only given where the Latin script is used.

Where more than one reference is given, the first is to the original paper, the others to notices in abstract journals. A key to the abbreviations used in the references is contained in the Bureau's *Bibliography of Soil Science, Fertilizers and General Agronomy*.

631.3 AGRICULTURAL EQUIPMENT

(See also Abs. No. 1867)

[1711] 631.3
ENGELHARD, J. Peut-on mécaniser l'agriculture? [Can agriculture be mechanized?] *Science et Vie* No. 356, 1947 (211-222). *Agron. Trop.* 3 (208). [F.]

A discourse on the theme that deserts have always resulted from men ignoring or transgressing the laws of soil fertility, and that mechanization has not changed any of the natural laws which agriculture imposes on man. As the basis for a rational agriculture the author considers the farm as a living entity which must be kept in a permanent state of functional equilibrium.

[1712] 631.347.2
POST, K.; SCRIPTURE, P. N. Copper tube automatic surface watering. *Proc. Amer. Soc. Hort. Sci.* 49, 1947 (395-404). B.A.BIII, 1948 (162).

Installations for automatic surface watering controlled by a tensiometer are described.

[1713] 631.347.24
GOUDIE, A. G. Systems of spray irrigation. Permanent and portable sprinklers and jet types. *Citrus News* 23, 1947 (167, 173). *Hort. Abs.* 18 (133).

Short descriptions are given of sprinklers for Australian citrus orchards. The cheapest spray system costs over £30 per acre to instal, to which must be added pumping costs of about £2 per acre per year. Spray irrigation is specially suited for light undulating soil, because watering is accurate and irregularity of contour causes no extra cost.

[1714] 631.347.24
KEMP, H. K.; HALLIDAY, O. E.; SPURLING, M. B. Sprinkler irrigation investigation. *J. Dept. Agric. S. Aust.* 51, 1948 (588-593).

A summary is given of observations made at the Berri Experimental Orchard on the horticultural aspects of sprinkler watering, particularly the practical manipulation of plant and the resulting water distribution.

[1715] 631.347.24 : 631.415.3
FARMERS' NEWSLETTER. Tomato irrigation experiment. *Farm. Newsletter* No. 15, July, 1948 (4).

Spray irrigation was compared with normal furrow watering on a salt-labile heavy soil. The resulting yields were 10.1 and 6.4 tons per acre respectively. Soil tests suggest that spray irrigation may be advantageous when salt is present in moderate amounts. There was no evidence that spraying favoured the development of spotted wilt or big bud.

[1716] 631.347.7
DUBOIS, R. H. Effect of end flares on capacity of irrigation siphon tubes. *Agric. Engng.* 29, 1948 (355-356).

The use of short plastic, rubber or metal tubes for siphoning water from irrigation ditches into furrows facilitates uniform distribution of water. The discharge from flared and unflared aluminium tubes 4 feet long was compared. Flaring the inlet increased the discharge by 9-15%, the 15% increase being given with a flare angle of 3° or 10° for a flare length of 6 inches. Flaring the outlet gave the corresponding values 3-15% (15%, 10°, 6 inches) and flaring both ends gave 12-39% (39%, 10°, 6 inches). For a given angle of flare, the capacity increased with the length.

631.4 SOILS

(See also Abs. No. 1976)

- [1717] 631.4
CROWTHER, E. M. **Soils and fertilizers.** *J. Roy. Agric. Soc. England* 108, 1947 (69-81).

Recent matters of interest discussed include:— (1) The French Conference on Mediterranean Pedology, representing the ecological and geological approach to soil classification. (2) Publication of the reports of two Land Classification Committees, which, departing from the ecological principle of the Land Utilization Survey, base their classification on the more permanent characteristics of the soils. (3) Tropical regions: a demonstration of the value of tie-ridging in conserving soil and water in semi-arid areas; the need for detailed soil and ecological work to find out how periodical leys can be fitted into existing farming systems, and for cooperative organization, possibly with a degree of compulsion equal to that applied in Britain today; the outlook for small-scale cotton growers in face of the increasing mechanization in the Southern United States. (4) Recent works on field experimentation; the simultaneous testing of several independent factors in experiments of modest size. (5) Minor-element studies; there are no grounds as yet for including trace elements in fertilizers or sprays for general use on land giving reasonably good crops. (6) The rationalization of fertilizer names and units; recommendations of the Royal Swedish Agricultural Academy's special committee. (7) Recent works on placement. (8) Phosphate fertilizers; "The development of new kinds of phosphate and compound fertilizers is limited in Britain by the legal requirement that, except for basic slags, the soluble phosphate shall be measured only in terms of water solubility". Foreign attainments in the manufacture of new classes of P fertilizer are discussed.

- [1718] 631.4:581.5
PALLMANN, H. *Pédologie et phytosociologie.* [**Pedology and phytosociology.**] *C. R. Conf. Pédol. Méditerran.* 1947, 1948 (3-36). [F.] [E.T.H., Zürich]

A general discussion of the inter-relations of pedology and plant ecology with special reference to the ecology of Swiss forests.

- [1719] 631.4:581.5
PICHI-SERMOLLI, R. E. **An index for establishing the degree of maturity in plant communities.** *J. Ecol.* 36, 1948 (85-90). [E.i.] [Univ. Florence]

The maturity index is the quotient of the frequency percentages in the community (Raunkier's "points") divided by the number of species found on the station; the more highly developed the community the higher the index. It has been applied in studies of changes in vegetation with consolidation of sand dunes and in studies of the vegetation of the Upper Tiber Valley where the communities of the serpentine soils are not as advanced as those of the screes or calanchiform stations and where trees do not represent an advanced type of vegetation but are intruders from neighbouring soils of different nature.

- [1720] 631.4:625.7/8
BARBER, E. S. **Electrical stabilization of soil.** *Roads and Streets* 91, No. 6, 1948 (64-65). C.A. 42 (6480).

Soil can be stabilized by the drying resulting from the heat generated by the passage of a.c. or d.c. through the soil. By electro-osmosis, water can be removed at the cathode, and the soil consolidated. This method has been used to promote drainage, increase the bond between piles and soil, and to introduce chemicals such as CaCl_2 .

631.41 SOIL CHEMISTRY

(See also Abs. Nos. 1715, 1742, 1755, 1771, 1972)

- [1721] 631.411.2:631.434
AUBERT, G. **Les sols à croûte calcaire.** [**Soils with calcareous crusts.**] *C. R. Conf. Pédol. Méditerran.* 1947, 1948 (330-337). [F.]

These crusts, commonly found in Algeria, in the Midi of France and in the lower valley of the Rhône, present a hard, bedded horizon on the surface, then a hard, often nodular mass, below which is a soft granular horizon.

Occasionally the crust is covered by a layer of soil. Most of the crusts in Algeria are fossil, dating from the quaternary era. One hypothesis regards them as simple geological formations, another as spring deposits, another as deposits from a water

table, another as the result of decalcification and subsequent erosion of upper horizons. The most usual theory is that they are produced by the ascent of soil solutions rich in lime which is precipitated at or near the surface. None of the theories corresponds to all the facts, and it is necessary to recognize that different phenomena are involved. Before the formation of the crusts can be explained they will have to be classified.

[1722] 63I.4II.2 : 63I.434
GAUCHER, G. Sur certains caractères des croûtes calcaires en rapport avec leur origine. [**Certain characteristics of calcareous crusts in relation to their origin.**] *C. R.* 227, 1948 (154-156). [F.]

Pomel's theory of the formation of calcareous and gypseous crusts in steppe and desert regions of the Mediterranean basin by the rise and evaporation of soil water or ground water is critically examined. The high CaCO_3 content, commonly reaching 85-90%, implies the absence of pre-existing horizons across which the evaporation could have occurred (or in which the crust could have collected by descent as in the "ortstein" theory); crusts also often occur immediately above impermeable rock. These facts, together with the considerable depth and extension of some of the crusts, suggest a geological rather than a pedological origin. The theory of their formation in the past by precipitation from water arriving from calcareous highlands appears reasonable.

[1723] 63I.4II.4
LANDRY, B. Les sols organiques. [**Organic soils.**] *Agriculture, Québec* 4, 1947 (107-112). [F.]

A general account of the properties, especially physical, of organic soils, and of the characteristics of the four groups distinguished by Dachnouski-Stokes—the aquatic, marsh, swamp and bog groups.

[1724] 63I.4II.4 : 63I.81
BRÜNE, F. Zeitgemässe Düngungsfragen der Moorkultur. [**Matters of topical importance in fertilizing moorlands.**] *Ztschr. Pflanz. Düng.* 37, 1946 (135-140). [G.]

It is stressed that moorland meadows producing 60 dz./ha. of hay require 120 kg./ha. of K_2O and 39 kg./ha. of P_2O_5 per year if their level of fertility is to be maintained, while permanent pastures require

about 60 kg. of K_2O and 30 kg. of P_2O_5 . However, moorland which has been well fertilized for a period of years stores up large amounts of moderately easily available P_2O_5 , but very little K_2O ; in these conditions the P_2O_5 application may be halved or quartered for 2 or 3 years or omitted for a year, whereas a similar procedure with the K_2O fertilizing would depress the clover and the more valuable grasses and also the quality of the hay and farmyard manure derived from them. N is, as a rule, required only on the arable fields of high-moor farms.

[1725] 63I.4II.4 : 63I.81
GOY, S. Düngungsversuche auf Niedermoor. [**Fertilizer experiments on low moorland.**] *Ztschr. Pflanz. Düng.* 37, 1946 (140-143). [G.]

Records of 5 years of experiment.

[1726] 63I.4I4.2 : 549
TEICHNER, S. Influence de traitements thermiques sur la texture et la structure d'une montmorillonite. [**The influence of heat on the texture and structure of a montmorillonite.**] *C. R.* 227, 1948 (392-393). [F.]

A montmorillonite in the Na and H states was subjected to varying temperatures up to 450°C . under a high vacuum for periods of 24-240 hours. The absorption isotherms indicated a multimolecular absorption without capillary condensation. Heating the H mineral to 450° under vacuum removed $\frac{3}{4}$ of the water of constitution but caused only a 10% diminution of the surface, whereas the Na form lost about $\frac{1}{3}$ while its surface decreased by 25%. A sample of the Na form was heated at 450° for 48 hours under vacuum, rehydrated by the introduction of water at 100° into the ampoule and then heated under vacuum at 180° to constant weight. It then possessed the same surface ($87\text{m}^2/\text{gm.}$) as a sample merely heated to 180° under vacuum. The rehydrated sample, however, differed from the second in having lost $\frac{1}{4}$ of its water of crystallization, whereas the second sample had lost no water of crystallization.

[1727] 63I.4I4.2 : 549
WEAR, J. I.; STECKEL, J. E.; FRIED, M. ET AL. Clay mineral models : construction and implications. *Soil Sci.* 66, 1948 (111-117).

A simple method for the construction of clay-mineral models is offered by the use of rubber balls threaded together into "sheets" in one plane with wire, using marbles or beads of appropriate relative size to represent the smaller ions. With 5 "sheets" it is possible to represent the typical minerals in the kaolinite, montmorillonite and mica groups. The sheets may be separated to show internal structure, and variations between the clay-mineral groups are easily shown in most cases, as is isomorphous substitution.

[1728] 631.414.2 : 549.623.93
BERGER, G. **The structure of montmorillonite.** *C. R. Conf. Pédol. Méditerran.* 1947, 1948 (119-122). [E.]

The presence of weakly acid OH groups in the crystal lattice of montmorillonite was demonstrated by methylating a very pure sample of H-montmorillonite with an ether solution of diazomethane. In this way a product was obtained containing about 122 m.e. of MeO per 100 gm. of methyl montmorillonite. Similarly methyl bentonites were obtained containing 96 and 110 m.e. of MeO per 100 gm. Samples of montmorillonite in which some of the H had been replaced by Na or Ba gave methylation products containing about 54 m.e. per 100 gm.

[1729] 631.414.2 : 631.44
SINGH, D.; LAL, G. **Kankar composition as an index of the nature of soil profile.** *Indian J. Agric. Sci.* 16, 1946 (328-342). [Punjab Agric. Res. Inst., Lyallpur]

Kankar occurs widely in the Indo Gangetic alluvial and black cotton soils. It is a hard lime concretion consisting of 50-70% of CaCO_3 , 25-45% of mother soil and a small percentage of free Fe_2O_3 , Al_2O_3 , P_2O_5 , Mn_2O_3 , MgO , K_2O and Na_2O . The hardness of *kankar* increases and pore space decreases with increase in maturity of the soil profile. The texture of the mother soil affects size, shape and carbonate content of *kankar*. Where the mother soils are of heavy texture, samples are small and hemispherical and have a high carbonate content of 60-70%. Those from light-textured mother soils are large, irregular, angular with holes penetrating through them and have only 50-60% of carbonates. With decrease in acidity there is an increase of Fe, P and Mn.

[1730] 631.414.3.03 : 631.415.1
HOSKING, J. S. **The cation exchange capacity of soils and soil colloids. 1. Variation with hydrogen ion concentration.** *Aust. J. Coun. Sci. Indust. Res.* 21, 1948 (21-37). [Build. Mat. Res. Lab., Highett, Victoria]

A rapid method for determining the cation-exchange capacities of soils, soil colloids and clay minerals involves the leaching of samples with ammonium-acetate solutions adjusted to pH values of 5-10 and the subsequent estimation of the absorbed ammonium by direct distillation. 1-5-gm. soil samples and 0.1-1-gm. mineral or soil-fraction samples may be used.

Results for soils ranging from podzols to chestnut earths, for colloids separated from them and for montmorillonite, halloysite and kaolinite samples show that in all cases the cation-exchange capacities increase from a minimum at pH 5 to a maximum at pH 9 and then decline sharply. The rate of increase per unit pH varies from 0.5 to 3.0 m.e. per 100 gm. and is independent of the soil or mineral type and of the magnitude of the cation exchange. The maximum capacities at pH 9 varied from 5 to over 100 m.e., being usually highest in soils or colloids of the montmorillonite types. It is considered that in some soils amorphous clay minerals with high exchange capacities play a more important part than is usually supposed. It is suggested that (1) the term "maximum cation-exchange capacity" should be used for the value at pH 9, (2) in comparing the exchange capacities of soils the maximum value should be used and (3) for complete characterization of the cation-exchange reactions of the soil, the cation-exchange capacity of the natural soil, the maximum capacity and the increase or decrease per pH unit should be stated.

[1731] 631.414.3.03 : 631.435
HOSKING, J. S. **The cation exchange capacity of soils and soil colloids. 2. The contribution from the sand, silt and clay fractions and organic matter.** *Aust. J. Coun. Sci. Indust. Res.* 21, 1948 (38-50).

The silt and sand fractions of the various soils studied were demonstrated to possess appreciable cation-exchange capacity related to the presence in these fractions of high

concentrations of the clay minerals, which are distributed throughout all the fractions as separated by standard mechanical-analysis procedures. By taking into account the total contributions from all the inorganic fractions, an average value of 280 m.e. per 100 gm. of organic C is obtained for the exchange capacity of the soil-organic matter, a value of $\frac{1}{2}$ to $\frac{1}{4}$ of the capacities previously suggested.—From author's summary.

[1732] 631.415.1:545.371
YU, H. A universal indicator of soil reaction (pH) test. (Bromocresol green-bromothymol blue-phenolphthalein mixture). *Soils Quart.* 6, 1947 (39-52). [Ch.]

[1733] 631.415.1:631.414.3
YARUSOV, S. S. [A study of exchange acidity.] *Dokl. Akad. S.-Kh. Nauk* 13, No. 1, 1948 (14-21). C.A. 42 (6481). [R.]

By using NaF on a soil extracted after having been treated with Ca(OH)_2 , the exchangeable Al can be titrated according to the following equations: $\text{Al}^{+++} + \text{Ca(OH)}_2 \rightarrow \text{Ca soil} + \text{Al(OH)}_3$; $\text{Al(OH)}_3 + 6 \text{NaF} \rightarrow \text{Na}_3\text{AlF}_6 + 3 \text{NaOH}$. It is considered that the exchange acidity in the surface horizons depends primarily on adsorbed H ions. In the lower horizons the exchange acidity is controlled by exchangeable Al.

[1734] 631.415.3
CARNEIRO, H. Notas sobre solos salinas e alcalinos. [Notes on saline and alkaline soils.] *Bol. Sec. Agric. Indust. Comercio Pernambuco* 13, 1946 (347-357). Biol. Abs. 22 (1452).

Causes of soil alkalinity are given and some of the chemical reactions are presented and discussed.

[1735] 631.415.7:631.416.7
MORIGATTI, J. D. W.; JOHANNESSON, J. K.; BROWNING, A. R. ET AL. Indicator plants. 1. Virginia stock as an indicator of lime availability. *N.Z. J. Sci. Tech.* 29A, 1947. (58-71). [Dept. Sci. Indust. Res.]

Virginia stock (*Malcomia maritima*) responded in growth to lime applied to podzols and peats which were low in base saturation. Seed emergence was increased with increased lime availability. Other factors being equal, its relative growth indicates lime availability in soils. It does not show a quantitative

correlation with 1%-citric acid-soluble phosphate but, given sufficient phosphate, Virginia stock may be used to compare the lime status of soils by visual observation alone.

631.416 COMPOSITION OF SOILS

(See also Abs. Nos. 1735, 1750, 1770, 1934, 1997)

[1736] 631.416:551.48
BRYANT, J. C.; SLATER, C. S. Runoff water as an agent in the loss of soluble materials from certain soils. *Iowa St. Coll. J. Sci.* 22, 1948 (269-297). [N.Y. Agric. Expt. Sta., Geneva and U.S. S.C.S.]

Only small amounts of soluble material were lost in runoff water in 13 months from eight 0.01-acre plots on a loam and a silty clay loam growing clover. Under most circumstances the removal of solutes and the loss of applied fertilizers are important factors in soil depletion. Soil type and cover affected both amounts and concentration of solutes lost in runoff. Concentration was increased by salts brought to the surface by capillarity and evaporation and decreased by the downward movement of solutes that accompanied infiltration. A series of flash runoffs with intermittent periods favourable to evaporation and the rise of soluble salts removes large quantities of soluble materials. Good cover reduces these losses and maximum losses occur on fallow soils. On soils already depleted, low infiltration rates and poor cover hasten the rate of soil exhaustion. At low nutrient levels solute losses in runoff water may be sufficient to continue the depletion of idle or abandoned land even though a sparse cover and an erosion pavement prevent major soil loss. Contour furrowing on such land intercepts runoff water and retains soluble nutrients dissolved in it.

The concentration of solutes in runoff tended to be highest in summer when evaporation was most effective. The amount of soil carried in runoff had no great effect on the concentration of solutes in the runoff. Applied fertilizers only temporarily increased the losses of solutes. Turning under lucerne sod on the silty clay loam increased the concentration of solutes but decreased the amount of runoff; turning under winter rye on the loam decreased both the concen-

tration of solutes and the amount of runoff, and infiltration and leaching were probably greater in the loam than in the silty clay loam.

[1737] 631.416:551.481:597
NĚMEC, A.; FASTOVÁ, J. [The chemical composition of soil from lake bottoms in Třeboňsko compared to the natural increment of fish.] *Sborn. České Akad. Zeměd.* 17, 1942 (84-87). C.A. 42 (6478). [Cz.g.]

In soils from fish-pond bottoms containing more than 1500 mg. of CaO per kg. of soil, the increment of fish depends on water-soluble K present in the soil, except when the bottom is covered with heavy vegetation which absorbs the soluble K and sometimes contains 3% of K in its ash. In soils containing less than 1500 mg. of CaO per kg. the increment of fish was small in spite of the soil being supplied with an abundance of K_2O and P_2O_5 . Fish failed to increase with soils rich in Al_2O_3 . Without heavy vegetation the waters over soils rich in CaO were also rich in K_2O . Without adequate CaO in the soil, the P_2O_5 becomes bound by insoluble Al and Fe compounds and does not enter the cycle soil-water-plankton-fish. Additions of P_2O_5 to soils with inadequate CaO are ineffective until the soils contain at least 1500 mg. of CaO per kg.

[1738] 631.416:631.811
BEAR, F. E. Modern trends in soil management. *N. Amer. Gladiolus Counc. Bull.* 14, 1948 (9-11). C.A. 42 (6479). [N. J. Agric. Expt. Sta., Rutgers Univ., New Brunswick]

An outline discussion of soil chemistry in relation to plant nutrition.

[1739] 631.416.2:631.417.2:631.445.7
CHAMINADE, R. Influence de l'humus sur l'assimilabilité des engrais phosphatés dans un sol latéritique. [Influence of humus on the assimilability of phosphatic fertilizers in a lateritic soil.] *C. R. Conf. Pédol. Méditerran.* 1947, 1948 (222-225). [F.]

0.2 and 0.5% of Ca humate was added to a lateritic soil with 20 mg. of P_2O_5 per 100 gm. of soil added as super., dicalcium phosphate or ground mineral phosphate. Barley was sown and harvested and analysed for P_2O_5 18 days later.

In the absence of humus the addition of P caused no increase in the P uptake of the plants—i.e., all the added P was fixed by the soil. In presence of 0.2% of humus the coefficient of utilization of phosphate was increased from 1-2% to 13-24%. Addition of 0.5% of humus did not further increase the utilization of P except with super., when it was slightly increased—from 14.6% to 17.7%.

When 50 mg. of P_2O_5 per 100 gm. of soil (corresponding to an application of 10 tons of super./ha.) was added, part of it remained unfixed, and the action of humus was consequently less marked.

[1740] 631.416.7:631.841
ROSEAU, H. Sur le pouvoir décalcarisant de certains sels dans le sol. [The decalcifying power of certain salts in the soil.] *C. R. Conf. Pédol. Méditerran.* 1947, 1948 (338-341). [F.] [École Nat. Agric., Algeria]

25-gm. samples of an old and a recent alluvium, containing about 20% $CaCO_3$, were leached with 2 litres of normal $(NH_4)_2SO_4$, NH_4Cl , K_2SO_4 , KCl , $NaCl$ and Na_2SO_4 . The amount of exchangeable Ca removed was taken as the difference between the Ca content of the first and second litres of leachate. The amount removed depended on the nature of both the cation and the anion of the salt used. Of the cations NH_4 was by far the most powerful decalcifier and K the least. SO_4 was a slightly more powerful decalcifier than Cl.

[1741] 631.416.8:631.415.1
WALLACE, T. Soil conditions and mineral deficiencies of plants, with special reference to deficiencies of the trace elements iron, manganese, boron, zinc, copper and molybdenum. *C. R. Conf. Pédol. Méditerran.* 1947, 1948 (248-266). [Long Ashton Res. Sta., Bristol]

Deficiencies of most of the trace elements tend to arise in association with a high soil pH. The one exception is Mo. On soils of low pH, deficiencies of the basic elements Ca, Mg, K and Na usually arise, as well as of P and N, and Mn and Al may occur in toxic amounts. In calcareous soils K deficiency is common. Organic matter may induce deficiencies of Mn, Zn and Cu. Deficiencies of B and Na are often associated with dry soil conditions, and of N and Mg with wet conditions. Availabilities of Fe and Mn in soils are largely determined by oxidation-reduction conditions.

[1742] 631.416.856:631.411.4
 LUCAS, R. E. **Chemical and physical behaviour of copper in organic soils.** *Soil Sci.* 66, 1948 (119-129). [Mich. Agric. Expt. Sta.]

48 lb. of a 50 lb./acre application of CuSO_4 remained in the upper 8 inches of a muck soil after 5 years, and 232 lb. of a 300-lb. application. Well over 50% of the Cu present in organic soils could be extracted with normal HNO_3 or HCl , but very little with ammonium acetate. CuSO_4 was precipitated, probably as the hydroxide, when the pH of the soil-water suspension was greater than 4.7. Studies of equilibrium reactions of Cu and H showed that the ratio of adsorbed cations at symmetry concentration was approximately 2 equivalents of H to 1 of Cu. Saturating a H-muck with Cu by leaching with Cu acetate showed that there was no simple exchange reaction. Titrimetric studies indicated that the Cu was adsorbed as Cu^{++} and $(\text{CuAcO})^+$.

[1743] 631.416.871.1
 FUJIMOTO, C. K.; SHERMAN, G. D. **Behaviour of manganese in the soil and the manganese cycle.** *Soil Sci.* 66, 1948 (131-145). [Hawaii Agric. Expt. Sta.]

Many Hawaiian soils have a high Mn content, ranging up to 9.7% of Mn_2O_3 . Application of lime or dolomite caused fixation of Mn and decreased the plant absorption of this element, while the addition of S, organic matter or chemical-reducing agents increased the exchangeable Mn and increased the plant absorption of Mn.

A new hypothesis is presented of the Mn cycle in soils. Two processes operate on the Mn oxides to influence the availability of Mn: the oxidation-reduction and the hydration-dehydration processes. Conditions favouring oxidation will decrease Mn availability, as will conditions favouring hydration, as, for example, surface mulching, which will keep the soil relatively moist and cool.

[1744] 631.416.871.1:546.223.2
 QUASTEL, J. H.; HEWITT, E. J.; NICHOLAS, D. J. D. **The control of manganese deficiency in soils. 1. The effect of sulphur and thiosulphates on crops growing on manganese-deficient soils.**

J. Agric. Sci. 38, 1948 (315-322). [Univ. Coll., Cardiff and Long Ashton Res. Sta., Bristol.]

The addition of sodium or calcium thio-sulphate to oats growing in a Mn-deficient fen soil in boxes markedly reduced symptoms of "grey speck" and increased the soluble-Mn content in the leaf tissues, but the effect was transient. The growth of beet in this soil in clay pots was improved by the addition of thiosulphates and also by painting the exterior of the pots with bitumen paint or by covering the surface of the soil with a thin layer of sand to prevent drying out. It is possible that reduced water loss or reduced aeration affects the equilibrium of the Mn cycle. The thiosulphate treatments increased the Mn uptake by the plants and reduced the symptoms of Mn deficiency.

Field experiments with an old garden soil deficient in Mn showed that placement of thiosulphate increased the Mn uptake of beet and reduced or eliminated Mn-deficiency symptoms, without producing any change in soil pH; broadcast applications were less effective. Peas were damaged severely when thiosulphates were broadcast, but the soluble Mn content of the peas was increased. Placement of sulphur increased the growth of beet in Mn-deficient soil and increased the Mn content of both beet and peas; soil pH was also lowered. The action of S in liberating divalent Mn in soil may be due to slow thiosulphate production and to acid formation. Results suggest that the placement of S and S-containing compounds may control Mn-deficiency in crops.

[1745] 631.416.877:619
 BARSHAD, I. **Molybdenum content of pasture plants in relation to toxicity to cattle.** *Soil Sci.* 66, 1948 (187-195). [Univ. Calif.]

A disease of cattle for which no pathological organism was found occurs in certain districts of the San Joaquin Valley, California. It appears to be caused by excessive amounts of Mo in certain species of plants, particularly in legumes, which absorb considerably more Mo than non-legumes. The plants themselves were unaffected. The Mo content of the soils was not particularly high as compared with normal soils, but its solubility was relatively high. This high solubility is ascribed to the alkalinity of the soils.

631.417 ORGANIC MATTER

(See also Abs. Nos. 1731, 1739, 1781)

[1746] 631.417.2 : 581.5
KILLIAN, C.; SCHNELL, R. Observations sur les formations végétales et les sols humifères correspondants des Monts Benna et du Fouta Djallon (Guinée française). [Observations on the plant formations and corresponding humous soils of the Benna Mountains and Fouta Djallon (French Guinea).] *C. R. Conf. Pédol. Méditerran.* 1947, 1948 (356-357). [F.]

No direct relationship was observed between dehumification of the soil, resulting from human interference, and either topography or vegetation. Humus tended to be highest in the valleys and lowest on hill tops. Dehumification was frequently associated with deforestation.

[1747] 631.417.2 : 631.414.3.03
MALQUORI, A. [The behaviour of organic matter in clay soils. II. Base exchange capacity of the organic matter and of the humic acid, and its relations to the base-exchange capacity of the clay.] *Ann. Chim. Appl.* 34, 1944 (111-126). C.A. 42 (6029).

The determination of the base-exchange capacity of the organic matter in soils by different methods is discussed critically. In a new differential procedure based on the principles of Gedroiz's method the soil remaining on the filter is washed with water. As soon as the excess KCl has been completely removed the K humate begins to dissolve, yielding a brown solution. When the washings become colourless the soil on the filter is resaturated with NH_4 by means of 0.1 N. NH_4Cl solution, followed by washing with 80% MeOH of pH 7. The NH_4 is then replaced by K through treatment with KCl solution and the NH_4 is determined in the filtrate with HCHO. The base-exchange capacity determined by the H_2O_2 method was about 300 m.e./100 gm. of organic matter, and by the new method about 500 m.e./100 gm. of humic acid. The latter figure agrees closely with that based on the equivalent weight of humic acid found by others. The difference in the results is explained by the fact that the organic matter extracted in the new method represents only the free humus and that absorbed on the surface of the mineral

colloids, while the organic matter oxidized by H_2O_2 includes humic acid combined chemically with sesquioxides. The base-exchange capacity of clay soils is an additive property only if the mobile humates alone are considered, but if that of the humus combined with sesquioxides is used, the result is smaller than that calculated. For this reason the new method gives more exact results than the H_2O_2 method.

631.42 TECHNIQUE AND ANALYSIS

(See also Abs. Nos. 1730, 1747, 1771, 1916)

[1748] 631.421
DORPH-PETERSEN, K. Parcellordeling i Markforsøg. [Plot arrangement in field experiments.] *Tidsskr. Planteavl* 52, 1948 (111-175). [D.a.e.]

Studies on the effect of plot arrangement on the experimental error showed that the restriction of one plot for each treatment in every row and column of a Latin square reduces the error to a minimum.

For larger experiments unsuited for a Latin square two methods of plot arrangement are discussed: (1) Fisher's method with block restriction and random distribution within blocks, and (2) fixed systematic plot arrangements in which blocks and other restrictions are retained. (2) generally gives smaller errors than (1).

[1749] 631.423.3 : 631.416.12/13
LEITHE, W. [Oxidimetric microchemical determination of nitrate in the presence of nitrite in waters and in soil extract.] *Mikrochemie ver. Mikrochim. Acta* 33, 1948 (310-315). C.A. 42 (6271). [G.] [Österreichische Stickstoffwerke, Linz]

A method previously described for the accurate determination of nitrate can be made a microchemical test for nitrite with results accurate within 0.004 mg. Detailed directions are given for samples containing 15-100% of nitrate, 3-25% of NaNO_3 , 0.05-4% of NaNO_2 and 1-80 mg./l. of NaNO_3 .

[1750] 631.423.3 : 631.416.316
MACINTIRE, W. H.; PALMER, G. The determination of fluorine attributable to soil incorporations of calcium fluoride. *J. Assoc. Off. Agric. Chem.* 31, 1948 (419-426). [Tenn. Agric. Expt. Sta.]

The F content of soils is registered accurately by direct distillation of unignited charges from H_2SO_4 and HClO_4 in succession, with titration against $\text{Th}(\text{NO}_3)_4$.

0.5 or 1.0 gm. of 325-mesh soil is distilled from 20 ml. of F-free H_2SO_4 (1+1) in a current of steam at 165°C until a distillate of 250 ml. is obtained, a 25-ml. aliquot of which is then distilled at 135° with 15 ml. of 60% HClO_4 that contained 0.2 gm. of Ag_2SO_4 , to obtain a 100-ml. distillate. The acidity of 20 ml. of this is determined by titration with 0.05 n. NaOH and that of the remaining 80 ml. is adjusted to contain the equivalent of 4 ml. of 0.05 n. HClO_4 . This 80-ml. aliquot is titrated with $\text{Th}(\text{NO}_3)_4$ of concentration 0.20 gm. of $\text{Th}(\text{NO}_3)_4 \cdot 4\text{H}_2\text{O}$ per litre that had been standardized against double distillates obtained from known amounts of NaF .

[1751] 631.423.3 : 631.811
BRAY, R. H. **Requirements for successful soil tests.** *Soil Sci.* 66, 1948 (83-89).

In chemical soil-fertility tests, the extracting solution must extract those forms of the given nutrient element that are available to the plant, that is, forms whose variations in amount are responsible for significant variations in yield and response to added fertilizers. This excludes, for example, K present in feldspar and also organic (humus) P, whose contributions to growth during the growing season are relatively insignificant. In the corn belt, for example, the exchangeable-K values were closely equivalent to the Neubauer values, and were highly correlated with crop response in field experiments, indicating no significant release from other forms during the growing season. While the relative significance of the different forms might be judged from their chemical nature, the final criteria are plant growth and response. The available quantity (b_1) of a nutrient having been determined in control plots (randomized over the whole area being tested) in which all nutrients except the one under study are adequate, the yields (y) of these control plots are compared with those (A) of plots adjacent to them and in which all nutrients are adequately supplied. The difference in yields provides a measure of the nutrient deficiency. The Mitscherlich-Baule relationship, $\log(A - y) = \log A - c_1 b_1$, in which c_1 is the proportionality constant,

held true for the exchangeable K and the adsorbed and easily acid-soluble forms of P for the soils of the corn belt. If A is made equal to 100, the percentage adequacy of b_1 may be calculated and hence the soil requirement of the nutrient in question.

It is suggested that only the relatively immobile nutrients as K and P can be made the subject of this type of correlation, and that for N the tissue test is more reliable than the soil test, while the tissue test for K and P would be a good indication of K or P deficiency only where the nitrate tissue test was positive.

[1752] 631.423.5 : 631.416.722.6
BOWER, C. A.; HUSS, R. B. **Rapid conductometric method for estimating gypsum in soils.** *Soil Sci.* 66, 1948 (199-204). [U.S. Reg. Salin. Lab., Riverside, Calif.]

Soil gypsum may be determined by shaking air-dried, sieved soil with sufficient measured distilled water to dissolve out the gypsum. An aliquot of the filtered extract is shaken with an equal volume of acetone and the flocculated precipitate centrifuged down, treated with acetone and recentrifuged. The centrifugate is shaken with distilled water and the conductivity of the resulting solution measured by means of a conductivity cell and Wheatstone bridge.

50-m.e./l. concentrations of Mg, Na, Cl and NO_3 did not interfere with the determination, but K concentrations higher than 10 m.e./l. caused high results; however, the K concentration of soil-water extracts rarely exceeds this value. Comparison with standard methods showed that the conductometric method gives reasonably accurate results but is slightly more accurate when Ca exceeds SO_4 . Errors due to temperature were within the accuracy limits of the method.

The addition of an equal volume of acetone to an aliquot of a soil-water extract constitutes a qualitative test for gypsum that may be made semiquantitative by comparing the turbidity with that of a standard suspension.

[1753] 631.425.22 : 631.437.31
BOUYOUCOS, G. J.; MICK, A. H. **A fabric absorption unit for continuous measurement of soil moisture in the field.** *Soil Sci.* 66, 1948 (217-232). [Mich. Agric. Expt. Sta.]

The usefulness of the plaster-of-Paris absorption-block method of following moisture changes in soils is limited to the region between field capacity and wilting point. The blocks also begin to disintegrate after some months in saturated environments. A unit made on the principle of the plaster blocks, with internal electrodes surrounded by nylon or fibreglass as the absorbent, measures the whole range from saturation to air dryness, and may supplement plaster blocks in wet conditions. A disadvantage of the nylon, and to a slighter extent of the fibreglass, is its lack of buffering power: a large salt content in the soil makes the fabric unit less sensitive to moisture changes, and a varying salt content is reflected in the readings. The units must be calibrated for each soil, and temperature corrections applied to each measurement where great accuracy is required.

[1754] 631.425.24.005
RICHARDS, L. A. **Porous plate apparatus for measuring moisture retention and transmission by soil.** *Soil Sci.* 66, 1948 (105-110). [Salinity Lab., Riverside, Calif.]

The laboratory construction and the use of an apparatus adapted for making soil-moisture determinations on large numbers of soil samples are described in detail. The apparatus is designed primarily for measuring soil-moisture-retention values of soils at discrete tension values in the 1-atmosphere range and is not suitable for obtaining characteristic moisture curves for a given soil sample over a series of tension equilibria obtained by measuring water-outflow increments corresponding to successive air-pressure increments. It appears suitable for measuring the unsaturated permeability of soil columns.

[1755] 631.425.5 : 631.411.2
ROSEAU, H.; BATS, J. Analyse physique des terres calcaires. [Physical analysis of calcareous soils.] *C. R. Conf. Pédol. Méditerr.* 1947, 1948 (87-92). [F.] [École Nat. d'Agric., Algeria]

Soil samples were peptized with 0.1 n. KCl, NaCl or $(\text{NH}_4)_2\text{SO}_4$ followed by washing with distilled water, and mechanically analysed by the international and by the pipette methods. Wide differences were obtained not only between the two methods, but also according to the peptizing agent

used. Peptization with $(\text{NH}_4)_2\text{SO}_4$ seemed the best, though with this reagent the difference in the clay content obtained by the two methods was greatest. The sum of silt and clay was, however, the same by both methods. The difference in clay content was attributed to the fact that after a time the clay flocculated, and that the time of sedimentation was different in the two methods. It is important, therefore, in the mechanical analysis of calcareous soils to know the maximum time for which the clay will remain peptized and not to prolong the sedimentation beyond this time.

[1756] 631.425.5.005
BARRETT, E. V. **A method of particle size determination of soils, cement, etc., by means of a chainomatic specific gravity balance.** *A. S. T. M. Proc.* 46, 1946 (1355-1376). *C.A.* 42 (6170). [Public Works Lab., Caracas, Venezuela]

A chainomatic specific gravity balance with a plummet suspended by a stainless steel wire is used to determine the surface area and particle-size distribution of fine-grained materials. The plummet is a highly polished glass sphere approximately 1.56 cm. in diameter, having a volume of 2 cc. A 7-gm. sample of washed and dried soil is dispersed with sodium silicate in distilled water in a 250-ml. graduate. A number of graduates are mounted in a water-bath tank which can be raised beneath the balance to immerse the plummet. A group of 14 soil samples can be tested in less than 8 minutes per sample. Reproducibility of test results is better than with any other method except the pipette method. Accuracy is better than that obtained with the hydrometer.

[1757] 631.427.2
JONES, P. C. T.; MOLLISON, J. E.; QUENOUILLE, M. H. **A technique for the quantitative estimation of soil micro-organisms.** *J. Gen. Microbiol.* 2, 1948 (54-69). [Rothamsted]

Soil micro-organisms have been counted by a new technique whose essential feature is the suspension of measured amounts of soil in a molten agar gel from which small drops are removed and allowed to solidify as thin films on a haemocytometer slide of known depth. The instantaneous gelation

of the agar ensures the fixation of the soil constituents in their original distribution. The films are dried and stained in a solution of acetic-aniline blue and permanent preparations made by subsequent dehydration in ethanol and mounting in euparal. If the suspension is of known dilution, since films of a definite volume contain a known quantity of soil, differential counts of a measured area of film will yield a quantitative estimate of soil micro-organisms.

The distribution of bacteria per microscopic field was found to be complex. The frequencies of bacterial colonies and of pieces of fungal mycelium form a Poisson series; those of the number of bacteria per colony form a logarithmic series; and those of the total number of bacteria per field fall into a negative binomial distribution.

The method appears to be capable of modification by the use of selective nutrient media for determining the quality of the microflora and possibly the percentage viability of the organisms present.—Authors' summary.

[1758] 631.427.2 : 631.461.51
XANDRI TAGÜENA, J. M. **Review of methods applicable in an investigation of the stimulation of *Azotobacter* by colloidal lignite.** *Inst. Investig. Agron. Madrid Pub.* 34, 1943 (193-256). B.A.BIII, 1948 (152).

Methods of isolating *Azotobacter* and counting the micro-organisms of soils are reviewed and criticised.

[1759] 631.427.3
BORESCH, K. **Zur Problematik der Bodenuntersuchung auf Düngebedürftigkeit. [A contribution to the problem of soil investigation in relation to fertilizer requirements.]** *Ztschr. Pflanz. Düng.* 37, 1946 (111-135). [G.]

In studies of about 1000 soils, the Neubauer rye-seedling method was compared with Egnér's lactate method for soil P. With soils very low in P both methods gave similar results, but the Neubauer test may under-evaluate the soil P in such soils when their absorptive power is high, and it very seriously under-evaluated the P status of richer soils of pH 7 and 8. The seedling method was also compared on 5 sandy loams mostly rather low in P, with the pot methods of

Mitscherlich and Wiessman, in which oats were used. The two pot methods showed good agreement among themselves for K and P, provided a low effect-factor was used for K ($c = 1.86$). The Neubauer method agreed with the others for K, but gave rather lower values for P, except in one P-rich soil, probably partly because N is not applied in this test but is applied in the pot test, and partly because of fixation of P provided by the seed.

The results of such physiological studies are compared with the fertilizer response as shown by several field experiments and the causes of the often considerable discrepancies are discussed, the importance of the lower soil layers—which are seldom included in the pot or seedling tests—of weather and of structure being stressed.

The repetition of a physiological test at the same point in a rotation at which the first test was made offers the best possibility of evaluating and improving the fertilizer and other measures taken on the basis of the earlier test.

[1760] 631.427.3
CLEMENTS, H. F. ET AL. **Potassium and sugar cane.** *Hawaii Agric. Expt. Sta. Bienn. Rept.* 1944-1946, 1947 (108-111). Hort. Abs. 18 (139).

The young leaf-sheaths were the most suitable of 4 index tissues tested, from which to determine the level at which K must be maintained for maximum crop returns. The K index, which is the K content of the sheaths expressed as a percentage of the sugar-free dry weight, varied from 0.17 to 5.10. At 0.17 the plants were stunted and sickly, while at 5.0 they were lush, but of poor quality. The minimum K index needed for adequate growth is about 2.25. The minimum P index for healthy growth has been set at 0.080 as a result of similar experiments.

[1761] 631.427.3 : 631.416.1
NEUBAUER, H. **Die Ausdehnung der Keimpflanzenmethode auf die Stickstoffbestimmung im Boden und in Komposterden. [The extension of the Neubauer seedling method to the determination of nitrogen in soils and composts.]** *Ztschr. Pflanz. Düng.* 37, 1946 (97-110). [G.]

The method has been used to determine the "root-soluble" N present in 30 soils.

The values obtained lay mainly between 0.1 and 6.2 mg. of N per 100 gm. of dry soil, reaching 10 and 15 mg. in an earth compost and a rich meadow soil respectively. While years of work will be needed to establish safe lower limits of soil N as a guide in fertilizing, the method is of immediate promise in following the processes occurring during decomposition and maturing of composts and compost-like materials.

[1762] 631.427.4 : 631.416.8
NICHOLAS, D. J. D. ; FIELDING, A. H.
The use of *Aspergillus Niger* (M strain) in the bioassay of magnesium, copper, zinc and molybdenum in soils. I.
Long Ashton Agric. Hort. Res. Sta. Rept. 1947, 1948 (126-137).

Preliminary results are given on the use of *Aspergillus niger* in the bio-assay of Mg and Cu in soils. The *Aspergillus* method can be used in the determination of the available Mg and Cu in soils and the results compare favourably with those of chemical methods. It was possible to determine Mg deficiency in soil in the presence of K deficiency, which was not shown by chemical analysis of the potato crop because of the interaction of K and Mg within the plant. Special purification procedures are given for the elimination of Cu, Zn and Mo from the media for the bio-assay of these micro-nutrients in soils.

631.43 SOIL PHYSICS

(See also Abs. Nos. 1813, 1942, 1954, 1998, 1999)

[1763] 631.432 : 551.49
CULP, M. M. **The effect of spillway storage on the design of upstream reservoirs.** *Agric. Engng.* 29, 1948 (344-346). [S.C.S., Milwaukee, Wis.]

Spillway storage is the amount stored between normal and flood-flow levels in reservoirs. Many upstream dams and spillways are overdesigned for capacity and are therefore expensive because spillway storage has not been taken into account. When it is allowed for, the resulting reduced discharge rate may stabilize eroding downstream channels or allow the use of steeper grades. Equations are derived for the approximate estimation of required spillway-storage

capacity in terms of reservoir topography, outflow and peak-inflow rates and average depth of runoff.

[1764] 631.432 : 551.49
PIPER, A. M. **Runoff from rain and snow.**
Trans. Amer. Geophys. Un. 29, 1948 (511-524).

The basic principles of the hydrologic cycle are reviewed with emphasis on storage and movement of water in the soil, a distinction being made between ground-water run-off and overland run-off in terms of storage and lag. The John Day, Deschutes and Metolius rivers of Oregon exemplify minimum, moderate and maximum effects, respectively, of storage and lag. The Metolius has extremely small fluctuations in discharge from year to year, a great part of its flow coming from ground-water run-off. Its response to fluctuations in annual precipitation lags by about 5 years behind that of the John Day. Techniques and measures for improving seasonal water-supply forecasts are suggested.

[1765] 631.432.2 : 631.43
CHILDS, E. C. ; GEORGE, N. C. **Soil geometry and soil-water equilibria.** *Disc. Faraday Soc.* No. 3, 1948 (78-85).

Certain measurable physical properties of the soil may be related to measurable factors in soil geometry, and in particular to the pore-size distribution which is defined as the water-occupied void space which, with the solid surface, is the seat of the soil's physico-chemical activity. The water content of the void space is acted upon by four kinds of forces arising from potential gradients, namely, gravity, hydrostatic pressure, osmotic pressure, and adhesion of water to solid surfaces. At equilibrium the total potential must be everywhere the same, and can be measured by allowing the soil system to come into equilibrium with a system of known potential components. These determine the moisture content of the soil, and a plot of potential against moisture content gives a characteristic curve, which for a non-shrinkable soil can be interpreted as indicating pore-size distribution in the soil, but cannot be so interpreted for shrinkable soils in which suction removes water by drawing the solid particles closer together.

Pore-size distribution has its most marked effect on permeability to fluids, and a theoretic-

cal treatment is given to show the mechanism involved. Experimental checks on coarse sand in a long vertical column show fair agreement between observed and computed permeabilities as a function of moisture content, and suggest that at a given moisture content the permeability is greater when that content is decreasing than when it is increasing.

The significance of some soil-moisture "constants" is discussed, and it is shown that several of them, including field capacity, while important and explicable in terms of more or less understood factors, are impossible of precise definition.—H.L.P.

[1766] 631.432.2 : 631.472
HALLAIRE, M. Profil hydrique d'un sol de limon en période de non-drainage; possibilité de le définir par l'humidité moyenne d'une couche quelconque du sol. [The moisture profile of a loam soil during a non-draining period; the possibility of defining it by the mean moisture content of any given layer of the soil.] *C.R.* 227 1948 (152-154). [F.]

From moisture-content records for the 0-15, 15-30 and 30-45-cm. layers of a variously cropped and tilled loam under Versailles climatic conditions, characteristic curves were obtained expressing the mean moisture content γ , γ' , γ'' of each 15-cm. layer as a function of the mean moisture content χ of the whole profile (0-45 cm.). The curves permit a definition of χ as a function of the moisture content of any given layer and also a representation of the vertical distribution of moisture as a function of χ . The results show that the form of the moisture profile of the soil studied is relatively independent of variations in soil structure or plant cover.

[1767] 631.432.21
SANDERSON, M. An experiment to measure potential evapotranspiration. *Canad. J. Res.* 26C, 1948 (445-454). [Dept. Physiog., Ontario Res. Found., Toronto]

A method is described for obtaining daily values of the potential evaporating power of the atmosphere. Results of an experiment verify Thornthwaite's formula for computing potential evapotranspiration in S. Ontario. The correlation between average runoff and computed water surplus for several catchments in Ontario and Quebec is shown on a map.

[1768] 631.432.21 : 581.116
SCHOFIELD, R. K. The measurement of evaporation. *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (85-86). [E.] [Rothamsted]

Measurements of evaporation have been made from (a) a free water surface, (b) a bare soil surface kept damp by a water table at 12 cm., and (c) soil carrying short-cut grass with a water table at 60 cm. There has been a close correspondence between the evaporation from the three surfaces, with small but consistent differences. During summer periods evaporation from (b) is about 10% greater than from (c). Evaporation from an unfertilized area of short-cut grass was the same as from a fertilized area giving three times the yield of grass cuttings, showing that increased growth does not necessarily entail increased evaporation.

[1769] 631.432.3 : 631.821.2
BODMAN, G. B.; MAZURAK, A. P. Infiltration of low sodium irrigation water into soil with dense layer, in relation to treatment with gypsum and other materials. *J. Amer. Soc. Agron.* 40, 1948 (621-644). [Univ. Calif.]

Field-infiltration experiments were carried out on a sandy loam with a high Ca/Na ratio and receiving 3.9 tons/acre of cotton hulls or 880 and 250 lb./acre of $(\text{NH}_4)_2\text{SO}_4$ when cropped to potatoes and cotton respectively, with and without $6\frac{1}{4}$ tons/acre of gypsum. The crop sequence for one half of all the plots was cotton-cotton-cotton-fallow, and for the other half, potatoes-potatoes-cotton-cotton. The irrigation water had a Ca/Na ratio of 4 and contained 374 p.p.m. of dissolved solids. The soil had a high dispersing tendency and a zone of high density a few inches below the soil surface that increased very slightly during the course of the experiment. Infiltration rates, which were measured early and late in the season for each plot, were unaffected by the treatments given, although more recent experiments elsewhere with soil and water of lower Ca/Na ratios indicate that gypsum may greatly increase infiltration rates.

[1770] 631.434 : 631.435 : 631.416.1
CLARKE, G. B. Effect of mechanical composition and nitrogen content on the water-stable aggregation of several soils. *Aust. J. Coun. Sci. Indust. Res.* 21, 1948 (51-58).

In the 7 soils studied a significant positive effect of clay and an insignificant effect of sand was found. 5 of the 7 soils showed a significant positive effect of silt. There was no significant difference between the effect of 5μ and 2μ clay on water-stable aggregation. The statistical data indicated a curvilinear relation between aggregation and mechanical composition. In 2 soils studied, aggregation was unrelated to N content.

[1771] 631.434:631.445-7
D'HOORE, J.; FRIPIAT, J. **Structural variations of Yangambi (Belgian Congo) soils.** *Soil Sci.* 66, 1948 (91-104). [INEAC]

The paper aims to indicate methods giving exact and significant values in the study of structural variations in tropical soils near Yangambi. The specific surface, S_o , of the fraction $<297\mu$ and the percentage contents of total and naturally peptized colloids (T and P) are sensitive to, and vary considerably with, disturbance of the equilibrium by deforestation, fallow, etc. S_o , calculated from the permeability for air, is a function of the soil structure and is correlated with P and F (the percentage of flocculated colloid). Peptization is most marked in the vicinity of rootlets, and thus in the uppermost soil zone. Frequency-intensity curves of the depth of the peptized layer show well-marked maxima which may indicate characteristic plants or associations.

A new dispersion method enabling determination of the reversibly flocculated colloid content is described. 10-20 gm. of air-dry soil is gently shaken for some seconds with 5 ml. of a freshly prepared 20% (by volume) solution of CCl_4 in methyl alcohol. 50 ml. of distilled water is added and the whole is violently shaken 4 or 5 times. After standing 1 minute, the suspension is decanted into a hydrometer jar, the residue being re-shaken and decanted until the supernatant liquid is clear. The jar is filled and the peptized-colloid content determined by the Bouyoucos-Casagrande method. The flocculated fraction is peptized by addition of an electrolyte such as ammonia, the suspension is decanted several times into a hydrometer jar, and the total-colloid content determined. The readings are taken after 45 minutes, this corresponding under the tropical conditions to a maximum diameter of 8μ . The formula $S_o = K + k F + 100 \kappa P/T$ was

applicable, in which K and k are parameters reflecting the quality (largely conferred by the parent material) of the flocculated colloids and κ is a constant reflecting the action of a vegetative association on the given type of flocculated soil colloid. It is by varying the κ value that soil structure can be most effectively influenced. Preliminary results of studies of the relationship between soil use and the κ value indicate a rapid decrease in the latter when comparison is made of primeval forest (the highest value), cleared primeval forest and young forest fallow (34.9, 17.6 and 15.6). Young secondary forest had the lowest κ value (13.8). The most favourable value of κ for agricultural purposes remains to be investigated.

[1772] 631.434:631.461:631.43
HUBBELL, D. S.; GARDNER, J. L. **Effects of aeration, compaction and water-logging on soil structure and microflora.** *J. Amer. Soc. Agron.* 40, 1948 (832-840). [S.C.S.]

Calcareous clay and sandy loam were ground to samples having maximum particle sizes of 2.38, 1.19 and 0.12 mm., subjected to increased and reduced aeration, submersion or compaction at 35 lb./square inch and were incubated for 30, 60 or 90 days. Compaction produced the greatest decrease in aggregation and microbial population. Waterlogging in general reduced aggregation and number of bacteria, but had little effect on the numbers of fungi and actinomycetes. With increased aeration, aggregation was in general lowered and the number of organisms was not consistently affected, whereas both were depressed in sealed samples. In the 0.12-mm. sample, aggregation was always lower than in the coarser-particled samples. Aggregation and microbial populations showed some correlation with non-capillary pore space, the former only in the 90-day period.

[1773] 631.435:539.16
HOOGTEIJLING, P. J.; SIZOO, G. J. **Radioactivity and grain size of soil.** *Physica* 14, 1948 (65-72). C.A. 42 (6234).

By measurements on separated grain-size fractions (0-2 μ , 2-16 μ , and 16-2000 μ) of several sedimentary soils, evidence was found for a preference of the radioactive elements for the grain sizes 2-16 μ . From

the variation of the activity with the amount of the material spread each time on the same surface, as well as from the comparison of the radium content with the total activity, it was concluded that the composition of the radiation depends on the fineness of the material. It was further concluded that the ratios of the concentrations of the various radioactive elements vary with the grain size. This variation is not only related to the material composition of the original material, but also is influenced by the combined processes of solution and adsorption during the sedimentation process.

631.44 SOIL TYPES

(See also Abs. Nos. 1739; 1771, 1925, 2022)

[1774] 631.44:551.41
MORISON, C. G. T.; HOYLE, A. C.; HOPE-SIMPSON, J. F. **Tropical soil-vegetation catenas and mosaics. A study in the south-western part of the Anglo-Egyptian Sudan.** *J. Ecol.* 36, 1948 (1-84). [Univ. Oxford]

The problem investigated was concerned with the recognition of soil-vegetation types and their mutual relationships. Data were interpreted on the general thesis that "the development of the soil on any site is mainly determined by the local topography through its effect on water-movement". The three main types of site comprised the high-level areas where soils may be grouped as the *eluvial* complex, slopes whose soils constituted the *colluvial* complex, and low-level areas receiving colluvial material, with their soils forming the *illuvial* complex. The vegetation also followed the form of a catena, but details were complicated by micro-relief, and the sequence tended to be confused where a ridge and a slope were succeeded by further undulations before a noteworthy drainage course was reached.

The parent rock of the area studied was basement gneiss and the vegetation savanna woodland. Of five natural regions, the main tributary-river region which was mainly one of eluvial and colluvial soils, and the flood-plain region which had a complex range of illuvial soils were studied in detail. Both regions were subject to pronounced desiccation alternating with heavy rains, yearly grass fires, shifting cultivation, erosion and

termite action. Soils of the eluvial complex were the shallowest, coarsest, most completely drained and carried mixed savanna woodland rich in species; those of the colluvial complex were deeper, finer, well drained and dominated mainly by *Combretum* species; the flooded illuvial complex had the deepest soils, which were mostly of heavy texture with drainage varying from fair to non-existent, and were associated with treeless grassland or a very restricted tree flora. Burning, as well as water conditions, was probably concerned in the reduction of numbers of species at the lower levels.

Catena variants were produced by variations in topography and rainfall. The eluvial complex was well developed under intermediate conditions and was contracted under the steepest conditions. The colluvial complex was best developed where a high rainfall was associated with narrow, steep ridges, but under these conditions the illuvial complex was poorly represented. Pedological, vegetational and floristic studies were made of three transects representing three catena variants. Soil-sample data showed that: (1) the texture became finer in the lower horizons and progressively from eluvial to illuvial soil; (2) the greater the eluviation the coarser the eluvial soil; (3) all soils were acid, acidity increasing in eluvial and decreasing in illuvial soils with depth; (4) exchangeable-Ca content was greatest near the surface; (5) the $\text{SiO}_2/\text{R}_2\text{O}_3$ ratios of comparable eluvial samples varied inversely with rainfall; (6) the $\text{SiO}_2/\text{R}_2\text{O}_3$ ratio was highest in illuvial soils and lowest in colluvials; (7) the $\text{SiO}_2/\text{Fe}_2\text{O}_3$ ratio did not show a regular progression according to topographical level.

[1775] 631.445.2:631.461
STARC, A. Mikrobiologische Untersuchungen einiger podsoliger Böden Kroatiens. [**Microbiological investigations in some podzols in Croatia.**] *Arch. Mikrobiol.* 12, 1941/42 (329-352). *Biol. Abs.* 22 (1668). [G.]

The connexions between the microbiological activity and the mechanical, physical and chemical properties of four different podzols were investigated, two of which came from meadows and two from forests. The number of micro-organisms appeared to diminish rapidly at a depth of 15-25 cm. Most were aerobic and heterotrophic, decomposing pro-

tein and reducing nitrates. The forest soils (pH 4.6) contain less bacteria and more moulds and actinomycetes and are more acid than the meadow soils. Notwithstanding the presence of NH_3 and nitrates, nitrifying organisms could not be found. The soils contain but a few aerobic cellulose-decomposing bacteria and N-fixation is very low. As the production of CO_2 is low, the conclusion may be drawn that the microbiological activity of the soil is small and the smaller the microbiological activity the higher the degree of podzolization.

[1776] 631.445.6
PENDLETON, R. L. **Mediterranean red soils.** *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (157-160.) [E.]

A summary of opinions expressed about terra rossa at the Mediterranean conference.

[1777] 631.445.6 : 631.46
KILLIAN, C. **Pédologie des terres astiennes, aux environs d'Alger, et des sols rouges qui en dérivent. [Pedology of Astian soils near Algiers and of the red soils derived from them.]** *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (371-372). [F.]

The calcareous sandstone (*mollasse*) and grit (*grès*) undergo profound physical and chemical changes in being transformed into red sand and clay soils (*terra rossa*). Parallel changes occur in their microbiology and vegetation cover. It was shown that microbiological activity was of a fundamentally different character in different types of soil. Activity was measured by the effect on cellulose or mannitol decomposition of additions of water or plant residues. It was shown, for example, that cellulose decomposition was greater in the red sand than in the calcareous sandstone, but less than in the red clay and calcareous grit. Cellulose decomposition was also used in controlled laboratory experiments to measure the influence of added plant residues on microbiological activity, and it was shown that the optimal activity varied according to the nature of the soil and the humus content. The general conclusion was that microbiological activity was directly dependent on local climatic conditions, the limiting factor being the summer drought.

[1778] 631.445.6 : 631.48
KILLIAN, C. **Pédobiologie des terres astiennes aux environs d'Alger et des sols rouges qui en dérivent. [Pedobiology of Astian soils in the neighbourhood of Algiers and the red soils derived from them.]** *Rev. Canad. Biol.* 6, 1947 (94-155). *Biol. Abs.* 22 (1453). [F.]

The physical, chemical and biological properties of these soils are discussed. Detailed data, mostly obtained by microbiological methods, are presented on the changes of the character of a calcareous soil where it is transformed into a red soil.

[1779] 631.445.6 : 631.48
GAUCHER, G. **Sur l'âge des sols rouges nord-africains. [The age of the North-African red soils.]** *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (373-376). [F.]

It is concluded partly on geological and partly on archaeological grounds that the red soils are fossil, having been formed in the Tyrrhenian period of the Quaternary. This does not exclude the possibility that red soils are being formed at the present time in localities where conditions approximating to those of the Tyrrhenian period obtain.

[1780] 631.445.6 : 631.48
REIFENBERG, A. **Some observations on red soils.** *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (161-163). [E.]

Evidence is presented that terra-rossa soils are being formed at the present time and that they occur only under specific climatic conditions, namely, a moist winter and a dry summer and within definite limits of aridity and humidity. The heavy winter rains promote hydrolysis, and the limestone dissolves, leading to an enrichment of silica and sesquioxides. The colloidal silica formed by hydrolysis peptizes the sesquioxides. During the dry seasons the sols ascend in the soil and are coagulated by a concentration of electrolytes, among which $\text{Ca}(\text{OH})_2$ may play an important role. This movement of sesquioxides protected by colloidal silica has been demonstrated in microscope slides of red soils by Kubiena.

[1781] 631.445.7 : 631.416.1
JENNY, H.; BINGHAM, F.; PADILLA-SARAVIA, B. **Nitrogen and organic matter con-**

tents of equatorial soils of Colombia, South America. *Soil Sci.* 66, 1948 (173-186). [Univ. Calif. and Lab. Quím. Nac., Bogotá]

N and C determinations were made on numerous soil samples from Colombia with a view to ascertaining whether similar relationships between N and organic-matter contents and temperature and rainfall obtained in a tropical climate as in the U.S. Under conditions of equal annual temperature and humidity Colombian soils had much higher N and C contents than North American soils. The tropical N values were akin to those of chernozem soils near the Canadian border (e.g. 0.2-0.4%). Many of the light-coloured soils from humid tropical regions were very rich in N and organic matter.

The N content of the Colombian soils increased markedly with altitude and decreased with mean annual temperature. These relationships are similar to but more marked than those found in U.S. soils. The C/N ratio also increased with altitude and decreased with temperature.

[1782] 631.445.7: 631.471
BAEYENS, J. Les méthodes d'examen des sols tropicaux et subtropicaux. [Methods for examining tropical and subtropical soils.] *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (320-329). [F.] [Univ. Louvain]

The only way to set up a "fertility scale" for tropical soils is to compare the results of hundreds of soil analyses on established plantations with the corresponding yield figures. The relationships so found can be applied with limited confidence to estimating the potentialities of virgin soils. Most plantations in the tropics are very variable in their soils, and the selection of the best sites for profile examination is a most important part of pedological survey. On uncultivated land the nature of the vegetation can serve as a guide in the selection of profile sites. The main factors to be considered in judging soil productivity are the climate, the morphology of the soil profile, the physical properties in relation to the hydraulic regime and the extent of the root system, the distribution of organic matter, and finally the chemical composition of the soil, though this is not important if the other factors are favourable.

631.452/3 FERTILITY. TOXICITY

(See also Abs. No. 1846)

[1783] 631.452: 631.472
JOFFE, J. S. A pedologic approach in solving some soil productivity problems. *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (226-247). [E.]

A plea for more reliance on interpreting field observations and less recourse to analysis in diagnosing soil deficiencies. It is claimed that pH and conductivity are the most important single-value tests that offer general evidence on the chemical and physico-chemical condition of the soil in relation to plant growth.

631.459 SOIL EROSION

(See also Abs. Nos. 1736, 1817, 1998, 1999, 2000)

[1784] 631.459
FARRIS, N. F. Soil erosion experiments at State College, Pennsylvania. *Pa. Agric. Expt. Sta. Bull.* 497, 1948, pp. 17.

The effect of length of slope, permanent sod, crop rotation and fallowing on the erosion of a silty clay loam on slopes of 8-15% were studied. As the slope length increased, the soil loss increased and water loss decreased. With sod crops the erosion danger was greatest while the seed bed was being prepared and the sod was becoming established. With long rotations of grain and cultivated crops, grasses and legumes should be included for periods longer than 1 year. The importance of contour strip-cropping and cultivation is stressed, and of adequately fertilizing and manuring severely eroded land to produce heavier covers and to improve the physical condition of the soil.

[1785] 631.459: 551.3.051
LOWDERMILK, W. C. Soil erosion and irrigation storage in North Africa. *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (405-406). [E.]

Protection of irrigation-reservoir capacity from losses by silting is required in long-range development schemes in North Africa. Main points to be considered in planning projects for the storage of streamflow are the rate, character and sources of silt production in catchment basins, and the effect of the

capacity/catchment-area ratio (C/C ratio) on rate of silting. The C/C ratio is particularly important—e.g., a small reservoir with a large catchment will tend to have a short life.

[1786] 631.459:551.41
GARDNER, W. H. **Determination of the critical stream for various slopes.** *Soil Sci.* 66, 1948 (205-215). [Utah Agric. Expt. Sta.]

The equation $q_c = b/s^v$ in which s is the slope, b and v are soil parameters and q_c , expressed in c.f.s./unit width of channel, is the critical stream above which the soil continues to wear down indefinitely, has been checked on 3 soils of different physical properties and appears to fit the experimental data. A flume 4 feet long and 20 inches wide with a slope increasing in increments of 0.1% for each 1.5 inches down the flume and with a tilting device to obtain still greater or smaller slopes, permits (1) fairly rapid measurement of the slope at which erosion just begins for a given stream and (2) determination of the value of the parameters for various soils. These parameters to some extent characterize a soil's erodibility.

[1787] 631.459:551.41
SMITH, D. D.; WHITT, D. M. **Evaluating soil losses from field areas.** *Agric. Engng.* 29, 1948 (394-396, 398). [S.C.S., U.S.D.A., and Univ. Missouri]

The principal factors affecting soil loss are cropping systems; land slope; variations in physical properties, fertility and erosion of the soil; rainfall amount, rate and distribution; conservation practices. Cropping systems alone are insufficient for the safe growing of crops on sloping land. Average annual soil loss in tons/acre, A , = $CSLK/P$ where C is the average annual rotation soil loss in tons/acre, S is the percentage land slope, L is the length of land slope, K is the soil-group factor which has been worked out for Missouri soils, and P is the contour-farming factor, a table of which is given for slopes up to 25%. Erosion equations are worked out for terraced land and for upslope soil movement by a normal ploughing on terraced land, and tables show what grain and row crops may be used with different conservation practices.

[1788] 631.459:551.577
ELLISON, W. D. **Soil detachment by water in erosion processes.** *Trans. Amer. Geophys. Un.* 29, 1948 (499-502).

A resumé is presented of some earlier work by the author on the evaluation of the factors concerned in soil detachment by raindrops (see *Soils and Fertilizers* 10 (288)). Work on detachment due to surface flow awaits the development of a standard "soil" of properties such that the abrasive characteristics of the flow will remain unaltered by materials detached from the "soil".

[1789] 631.459:631.416
KURON, H. **Bodenerosion auf der Schwarzerde der Magdeburger Börde.** [Erosion on the black soil of the Magdeburg Plain.] *Ztschr. Pflanz. Düng.* 37, 1946 (144-151). [G.]

Mechanical and chemical (humus, CaCO_3 , K_2O , P_2O_5 and hygroscopic water) analyses were made of soil samples from various depths at 8 positions down a slope of 350-m. length (of loess above marl) falling to a level of 108 m. from a plateau of altitude 125 m. As the gradient increased from 0% to the maximum of 10%, the humus and P_2O_5 contents of the 0-25 cm. layer decreased from 2.27 to 1.27% and from 11.8 to 2.2 mg./100 gm. respectively. The K_2O content, due to its tendency to migrate downwards in the soil, decreased only from 16.3 to 8.8 mg./100 gm. As the slopes flattened out, the K_2O and P_2O_5 contents rose, the humus content remaining fairly steady. The rise in the CaCO_3 content from 0.26% on the plateau to 8.74% on the 10% slope showed how near the lime-rich subsoil had approached the surface. The figure of 12.39 for the next position below this (7% slope) is probably due to enrichment by the seeping-out of lime-rich water at this point.

[1790] 631.459:631.61:33
JACKS, G. V. **Soil conservation and human ecology.** *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (220-221). [E.]

It is suggested that soil conservation is essentially a problem of human ecology, and that the structure of human societies should be studied with reference to their effect on the soil in the same way as plant societies are studied in relation to their effect on soil conservation.

[1791] 631.459 : 631.62 : 778.35
SOUTH AFRICAN SUGAR JOURNAL. **Aerial surveying. Value in soil conservation and scientific farming.** *S. Afric. Sug. J.* 32, 1948 (331).

A popular explanation of the usefulness of aerial survey in the conservation planning of an area.

631.46 SOIL MICROBIOLOGY

(See also Abs. Nos. 1758, 1772, 1775)

[1792] 631.461 : 576.809.7
GOODMAN, J. J.; HENRY, A. W. **A strain of *Bacillus subtilis* possessing distinctive antibiotic properties towards *Xanthomonas translucens* and other bacteria.** Abs. in *Canad. Phytopath. Soc.* 15, 1947 (19). *R.A.M.* 27 (357).

A rough strain of *B. subtilis*, isolated from soil, was found to be relatively non-phyto-toxic and antagonistic to some bacteria, including *Xanthomonas translucens*, *Pseudomonas coronafaciens*, *Erwinia carotovora* and *Bact. tumefaciens*.

[1793] 631.461 : 576.809.7
RUDERT, F. J.; FOTER, M. J. **Bacillin production by soil isolates.** *J. Bact.* 54, 1947 (793). [Wm. S. Merrell Co., Cincinnati, Ohio]

Soil samples from widely different areas of U.S.A. were examined for bacilli antagonistic to *Escherichia coli*. 23 soil samples yielded 46 isolates of which the antibiotic material was fairly heat-stable; its activity was greatly reduced by complex body fluids and was totally inactivated by H_2S . Its properties indicate an identity with bacillin. The widespread occurrence of organisms producing this antibiotic and its marked antagonistic properties in the absence of complex nutrients suggest that it may have a role in controlling the microbial flora of the soil.

[1794] 631.461.3 : 546.47 : 546.56
LEES, H. **The effects of zinc and copper on soil nitrification.** *Biochem. J.* 42, 1948 (534-538). [Rothamsted]

The effect of Zn and Cu on soil nitrification was assessed by percolating 10 gm. of soil, which had been stimulated to active nitrification, with 100 c.c. of 2.5×10^{-3} M. $(NH_4)_2SO_4$ with or without the addition of $ZnSO_4$ or

$CuSO_4$. Within a few hours most of the Zn or Cu was transferred to the soil but the mechanism concerned was not the normal soil base-exchange system. Zn inhibited nitrification more than Cu, the effect being less on an organic than on a mineral soil. Low concentrations of Cu stimulated nitrification by an insignificant amount; removal of Cu by Na diethyldithiocarbamate effected an inhibition of nitrification that could be completely and partially reversed by percolating $CuSO_4$ and $MnSO_4$ respectively through the soil.

[1795] 631.461.3 : 631.417
LEES, H. **The effects of various organic materials on soil nitrification.** *Biochem. J.* 42, 1948 (528-531). [Rothamsted]

10-gm. batches of air-dry, sieved garden soil, which had been stimulated to active nitrification by percolation with 2.5×10^{-3} M. $(NH_4)_2SO_4$, were percolated with 100 c.c. of 2.5×10^{-3} M. $(NH_4)_2SO_4$ alone or with $(NH_4)_2SO_4$ plus 0.1% gelatin, peptone, humus, glucose or agar. The duration of the preliminary experiment was 24 hours, but as heterotrophic proliferation, which would result in immobilization of mineral N, appeared to take place in the presence of glucose towards the end of this period, the duration period was reduced to 5 hours. Considerable amounts of nitrite and nitrate were formed in the presence of organic materials. This suggests that if the organic materials that are supposed to inhibit nitrification in culture do so in soil, the inhibitions by 0.1% of the materials tested are small.

[1796] 631.461.3 : 631.417
LEES, H. **The immobilization of mineral nitrogen in soils by different organic materials.** *Biochem. J.* 42, 1948 (531-534). [Rothamsted]

Garden soil and Romney-Marsh soil were percolated with 10^{-2} M. $NaNO_3$ solution alone or with $NaNO_3$ plus glycerol, glucose, sucrose, K oleate, K stearate, Na formate, tristearin, tributyrin and benzoic acid at 1.2 mg. C/c.c. NH_4^+ , NO_2^- and NO_3^- were determined periodically in 2-c.c. samples of the percolates. Immobilization of NO_3^- differed initially for different organic compounds and led to a rise in pH of about 0.5 in the early stages, due to the release of Na^+ . The constancy of the nitrate-N concentration

of the control percolates indicated that there was no endogenous-N immobilization by compounds in the soil itself. The amount of N immobilized increased as the amount of soil in the system decreased and when CO₂ was added to the air entering the system. The N-immobilizing mechanism appeared to be poisoned by 10⁻³ M. Na azide but not by the iodoacetate or chlorate, suggesting that heavy-metal enzymes may be involved.

[1797] 631.461.5 : 547.457.1
BILARDELLO, M. Sulle variazioni numeriche degli azotofissatori e dei cosiddetti "glomeruli" o "ammassi schizomicetici glomerulari" per aggiunta di glucosio al terreno. [Changes in numbers of nitrogen-fixing organisms and of so-called "glomerules" or bacterial clumps brought about by addition of glucose to soil.] *Ann. Fac. Agrar. Portici* 11, 1939-1940 (170-199). [I.]

Numbers of bacterial clumps (observed directly on glass slides) and of *Azotobacter* and *B. amylobacter* (as revealed by cultural methods) underwent relatively small and brief changes after glucose at the rate of 5 quintals per hectare was added to manured soil at Portici. Soil buried in shallow perforated aluminium containers showed similar changes, indicating that aluminium was not in itself toxic.—R.N.

[1798] 631.461.51 : 631.847.2
STARCK, A. Zur Frage der Rhizosphäre und Bodenimpfung mit *Azotobacter*. [The problem of the rhizosphere and inoculation of soil with *Azotobacter*.] *Arch. Mikrobiol.* 13, 1942/43 (164-181). *Biol. Abs.* 22 (1668). [G.]

Inoculation with *Azotobacter* had no effect on the yield of maize in sand cultures. There was, however, a small increase of N. *Azotobacter* develops in the neighbourhood of the rhizosphores, but not upon them. When other bacteria are present *Azotobacter* is driven away from the root hairs. It is possible that the products of the root hairs have to be changed by other bacteria before *Azotobacter* can utilize them. It is clear that inoculation of soil with *Azotobacter* is of little use. It will be more useful to bring the soil into such condition that the *Azotobacter* present in it can easily develop.

[1799] 631.461.74
LOCHHEAD, A. G. Chromogenic bacteria related to *Bacterium globiforme*. *J. Bact.* 55, 1948 (579-580). [Dept. Agric., Ottawa.]

Chromogenic (yellow) forms of bacteria related to *Bacterium globiforme* seem to have been encountered much less frequently than the non-chromogenic types, though there is reason to believe that they are common in soil and associated with the growing plant. In a study of the influence of plant growth on the character of the soil-bacterial flora, the percentage of chromogenic types of the *Bacterium globiforme* group was markedly increased in the rhizosphere. 42.3% of all strains of this group isolated from soil adhering to roots were yellow forms.

[1800] 631.461.74 : 547.56
EVANS, W. C. Oxidation of phenol and benzoic acid by some soil bacteria. *Biochem. J.* 41, 1947 (373-382). [Biochem. Lab., School of Medicine, Leeds]

Using a simple mineral-salt medium, certain micro-organisms isolated from soil, sewage and faeces will grow and completely metabolize phenol and benzoic acid used as the sole source of organic C. The oxidation of the benzene ring within living organisms and the possible role of these micro-organisms in the prevention of aromatic compounds from accumulating in toxic amounts in the soil are discussed.

[1801] 631.461.74 : 577.16
TISHLER, M.; SAMPSON, W. L. Isolation of vitamin K₂ from cultures of a spore-forming soil bacillus. *Proc. Soc. Exptl. Biol. Med.* 68, 1948 (136-137). *C.A.* 42 (6398). [Merck Inst., Rahway, N.J.]

A substance isolated from autolysed cells of *Bacillus brevis* was shown by chemical and biological tests to be identical with vitamin K₂.

[1802] 631.462 : 632.953
DALTON, F. H.; HURWITZ, C. Effect of volatile antiseptics on survival of microflora in soil. *Soil Sci.* 66, 1948 (233-238). [Mass. Agric. Expt. Sta.]

Although a large amount of work has been done on the effect of "partial sterilization" of soil microflora, comparatively little has been done on complete sterilization. This

can be effected by steam sterilization, but the use of steam also changes soil properties, particularly those connected with soil-organic matter. The comparative efficiency of disinfectants on the survival rate of the soil microflora is said not to have been studied. A method is described for sterilizing soil for laboratory studies that would permit subsequent removal of the sterilizing agent and would cause a minimum change in the soil itself. It involves storing soil in sealed containers with the atmosphere saturated with the fumes. Two glass tubes were inserted through a rubber stopper fitted through the screw lid of a quart jar, so that a vacuum could be drawn through one and liquid transported through the other into a 20-ml. beaker placed in a small wire basket soldered to the underside of the lid beneath the hole containing the rubber stopper. The effects of chloroform, HCN, formaldehyde, CCl_3NO_2 and ethylene oxide on the survival of soil microflora in an evacuated system were determined. Ethylene oxide sterilized soil after 11 hours exposure, formaldehyde after 3 days and CCl_3NO_2 after 8 days. Chloroform and HCN decreased the numbers of viable micro-organisms, but did not sterilize soil after 10 and 8 days' contact respectively. Ethylene oxide was the most lethal of the disinfectants tested and induced the least increase in ammonium-acetate-soluble Cu and Mn. Formaldehyde and especially CCl_3NO_2 caused great increases in the extractable Mn of the soil. The increase of Cu and Mn when the soil was treated with CCl_3NO_2 and formaldehyde was large enough for possible toxic effects to be considered.

Soluble Cu was increased from 1.4 μg . per 10 gm. of dry soil in the untreated soil to 29.8 μg . with flowing steam after 60 minutes and to 91.4 μg . with CCl_3NO_2 . Flowing steam for the same period increased the Mn concentration to 65.5 μg . and CCl_3NO_2 to 185.5 μg /10 gm. of dry soil.

The lowered atmospheric pressure (40 mm. Hg) did not cause any significant decrease in the numbers of micro-organisms.

[1803] 631.466.1
NIETHAMMER, A. Weitere Beiträge über Verbreitung und Leben mikroskopischer Bodenpilze [Further contributions on

the distribution and life of microscopic soil fungi.] *Arch. Mikrobiol.* 12, 1941/2 (312-328). *Biol. Abs.* 22 (1668). [G.]

Investigations were made as to which fungi occur in uncultivated soils, meadows, fields and forests in Styria and Saxony. Types such as *Mucor hiemalis*, *Penicillium* and *Trichoderma koningi* were found to be very common. A detailed description is given of the most important fungi.

[1804] 631.466.1
NIETHAMMER, A. Weitere Beiträge über mikroskopische Bodenpilze. [Further contributions on microscopic soil fungi.] *Arch. Mikrobiol.* 13, 1942/43 (60-73). *Biol. Abs.* 22 (1668). [G.]

The names of the micro-organisms isolated from different soils are collected in the tables. The moulds isolated from moors lacking cellulose-destroying bacteria were much more active in attacking cellulose than the moulds isolated from fields and forests.

[1805] 631.466.3: 631.462
BOOTH, W. E. The thermal death point of certain soil inhabiting algae. *Proc. Montana Acad. Sci.* 5/6, 1946 (21-23). *Biol. Abs.* 22 (1667).

Species of soil-inhabiting algae were collected from the surface crust on abandoned crop land and retained in the laboratory for 1-2 months preparatory to oven heating. They were killed after 1 hour at temperatures varying from 110°C. to 113°C.

[1806] 631.467.1
SINGH, B. N. Studies on giant amoeboid organisms. I. The distribution of *Leptomyxa reticulata* Goodey in soils of Great Britain and the effect of bacterial food on growth and cyst formation. *J. Gen. Microbiol.* 2, 1948 (8-14). [Rothamsted]

Giant amoeboid organisms may be isolated from soil and other materials by the use of suitable edible bacteria supplied on a base of non-nutrient agar. With *Leptomyxa reticulata*, which is widely distributed in the soils of Great Britain, degrees of pH between 4.1 and 8.7 had no effect on the abundance of growth when a suitable bacterial strain was provided as food. 92 very varied strains of bacteria varied greatly in edibility, those producing red, violet and blue pigment being mostly inedible. There was no correlation

between edibility and either Gram-staining or the property possessed by certain bacterial strains of inducing the formation of cysts by *L. reticulata*.—From author's summary.

631.47 SURVEYS

(See also Abs. No. 1782)

[1807] 631.471
GRIFFITH, A. L.; GUPTA, R. S. **The recording of soil and site characteristics in the field.** *Indian Forest Bull.* 135, 1947, pp. 14.

Describes methods of recording the characteristics of soil sites, the description of soil profiles and the collection of soil samples.

[1808] 631.471: 778.35
BURINGH, P. Aardrijkskunde uit de lucht. [Geography from the air.] *Kon. Ned. Aardrijksk. Gen.* 65, 1948 (395-399). [Du.]

6 aerial photographs are presented and discussed that depict (1) grassland on sandy soil, (2) an undulating landscape on sandy soil where land use is determined by relief, (3) the Maanen sandy ridge where the arable land is confined to the ridge and pasture to the valleys, (4) a grassland and arable landscape on sandy soil, (5) a young conifer plantation on heathland and gully erosion on arable land and (6) a young plantation and woods where growth differences due to banks of gravel and loam can be seen. Scales are 1: 7600-9600.

631.48 SOIL FORMATION

[1809] 631.48: 549
EDELMA, C. H.; SCHUFFELEN, A. C. **On the origin of some clay minerals in soils.** *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (109-114). [E.]

Reference is made to the theory that kaolinite is formed under acid conditions, and montmorillonite under neutral or alkaline conditions, although acid clays containing montmorillonite and alkaline clays containing kaolinite are frequently found. It is suggested, however, that these exceptions to the theory occur where the clay minerals have not been formed *in situ*.

The theory is advanced that the optimal conditions for clay-mineral formation arise at the isoelectric point or near the inflexion point of the titration curve. At this pH the clay mineral is relatively insensitive to its environment, and the possibilities for the development of a crystal lattice are greatest. The titration curve of kaolinite shows an inflexion point near pH 4, and that of montmorillonite two inflexion points—one at pH 3.5 (which is not considered of importance) and another at pH 7. This latter curve shows that the presence of exchangeable bases in the formation of montmorillonite is essential and explains how a compound rich in SiO_2 is produced under alkaline conditions of soil formation.

[1810] 631.483
VILAS, L. **The molecular ratio $\text{SiO}_2/\text{R}_2\text{O}_3$ of clays as characterization of soils.** *An. Fiz. Quim. Madrid* 39, 1943 (491-511). C.A. 42 (6030).

There is a difference between soils of the Spanish humid and arid zones. Samples from the humid zones show a $\text{SiO}_2/\text{R}_2\text{O}_3$ ratio of 1 to 2, whereas soils from the arid zones show 3 to 5. This is characteristic. CaCO_3 exerts a decisive influence on the ratio in each area.

631.5 CULTURAL OPERATIONS

(See also Abs. Nos. 1874, 1875, 1932, 1956, 1963)

[1811] 631.51
RUSSELL, E. W. **Current problems in soil cultivation.** *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (93-96). [E.] [Rothamsted]

Experiments in England have shown that the mouldboard plough has a capacity possessed by no other implement for killing weeds in cool damp weather. This is its main function in humid temperate climates. If the land is free from weeds the plough has no apparent advantage over other cultivating implements. It may have grave disadvantages where erosion is likely to occur.

The results of deep ploughing are variable, but it seems that deepening a layer of fertile (but not infertile) soil can help crops to withstand short droughts. Deepening the zone of fertilizer placement can have a similar result.

The benefit of cultivating soil in a growing crop is also mainly to kill weeds. There is evidence that little benefit is derived from a dust mulch made by hoeing. In the sub-tropics methods such as stubble mulching are being devised to control weeds without leaving a bare surface. In the humid tropics the problem of safe weed control has not yet been solved.

[1812] 631.512
PAGE, J. B. **Don't throw away your plow.** *Successful Farming* 45, No. 5, 1947 (30-31, 60, 62). Biol. Abs. 22 (1454).

Nine-year tillage tests for maize prove that the regulation plough does the best job of land preparation for this crop. Other systems tried were minimum tillage, rotary, subsurface and discing only. Minimum tillage did a fair job, as did the new "TNT" plough. All others did poor to very poor work.

631.61 LAND RECLAMATION

(See also Abs. Nos. 1977, 2010)

[1813] 631.61 : 627.51
GLASS, J. S. **Flood surveys and flood control operations.** *Agric. Engng.* 29, 1948 (307-309). [S.C.S., Milwaukee, Wis.]

A description is given of the stages of a flood survey as carried out by the Soil Conservation Service on catchments of several thousand square miles in area, and also of the way in which work plans based on the survey report are developed, publicized and implemented in the individual districts concerned in the interests of flood control and soil and water conservation.

[1814] 631.611
SAKSHAUG, B. **Forsøk med dyrkingsmåter.** 1. Forsøk på granskogbotn på beiteforsøks-gården. 2. Forsøk på elvegrusjord på Fløtre i Breim. [Trials with methods of cultivation. 1. Trial on spruce-forest land at the grassland experiment station. 2. Trial on heath land at Fløtre in Breim.] *Årb. Beitebr. Norge* 17, 1944-45, 1947 (57-81). Herb. Abs. 18 (185). [N.]

Pasture trial 1 was on good-quality moraine land with a thin stand of spruce and

alder. It had previously been grazed by cattle and horses and was drained. The trials were (a) complete cultivation through ploughing, (b) breaking up of stumps and harrowing, (c) stumps left untouched, but surface harrowed, (d) stumps untouched and fertilizers applied to natural cover. Treatment (c) was the most practical method.

Trial 2 included (e) complete cultivation through ploughing, (f) harrowing and sowing, (g) sowing seed on spots left bare after clearing. All three treatments gave almost the same yield of fodder for 9 years and milk production was about the same.

[1815] 631.611
GEMMEL, J. T. **Reclamation of river flats subject to flooding.** *Tasm. J. Agric.* 19, 1948 (131-134).

Rivers such as the Clyde, Shannon, etc., drain large areas and quite light rains may cause flooding at any time of the year. Their alluvial flats, capable of carrying first-class rye grass and clover pastures, are under gorse and sedges. Such land has been successfully reclaimed by burning the top growth, grubbing with mattocks to below the crown of the gorse (deep ploughing may be substituted only in back-water areas with little flood velocity), burning the gorse, lightly discing in autumn without undercutting the natural cover and sowing subterranean clover at 4 lb. and super. at one bag per acre. With annual top-dressings of super. at the same rate, the clover gradually smothers the sedge tussocks and pasture grasses enter. Land which would in its original state fatten one beast to 7 acres would probably average a beast to 1½ acres on elimination of the sedges.

[1816] 631.612
FUSSLEIN, E. R. **Grass and tree bind moving dunes. Driftsand reclamation in Zululand.** *Farm. Week. S. Africa* 75, Sept. 8, 1948 (52-57).

59 square miles of sandy waste land have been reclaimed along the coast of Zululand. The annual rainfall is 55 inches, but the land had been eroded as a result of over-grazing and bush fires. Barriers of poles standing 4½ feet above ground level with a fine-stranded wire fence were erected at intervals of 20-30 feet, at first parallel with

the direction of the prevalent N-S wind and later cross barriers were erected. Grass windbreaks were then made by binding cut long grass to the fence just below the top wire of the fence and allowing the grass to drape on either side. These barriers alter the direction and effects of the wind, causing the sand to move in desired directions. Indigenous grasses are then planted, followed by creeping plants and shrubs. No fertilizer is used and no irrigation. Trees are planted later. *Erythrina caffra*, acacias and *Brachylaena discolor* thrive in the sand and are heat- and drought-resistant. *Casuarina equisetifolia* and *Eucalyptus* spp. have grown well. The area is usually in a fit state to stand alone after 6 months—2 years, when the fences are demolished.

It is intended to plant the area gradually with pines and eucalyptus trees for timber.

[1817] 631.612 : 633.285
BROWN, R. L.; HAFENRICHTER, A. L.
Factors influencing the production and use of beachgrass and dune grass clones for erosion control: II. Influence of density of planting. *J. Amer. Soc. Agron.* 40, 1948 (603-609). [Nursery Div., S.C.S.]

Ammophila arenaria was planted for three successive years with and without the addition of 40 lb./acre of N as $(\text{NH}_4)_2\text{SO}_4$ at 12-, 18-, 24- and 36-inch intervals using three and five culms per hill for each spacing. First-order interactions between density \times fertilizing, density \times years and fertilizing \times years were highly significant. N had the greatest effect on net production (the number of culms produced per acre above the number planted) when planting density was high and, of the three factors, was next to spacing in importance. The number of culms per hill affected production only in close spacings and five culms per hill gave greater increases in 12- than in 18-inch spacings. When sand accumulation and cost of planting were considered together a density of 24×5 was most efficient on moderately eroded sites while densities of 12×5 and 18×3 were not efficient unless fertilized. The number of culms per hill was more important than spacing when density and erosion control were correlated.

[1818] 631.612 : 633.285
BROWN, R. L.; HAFENRICHTER, A. L.
Factors influencing the production and

use of beachgrass and dune grass clones for erosion control: III. Influence of kinds and amounts of fertilizer on production. *J. Amer. Soc. Agron.* 40, 1948 (677-684). [Nursery Div., S.C.S., U.S.D.A.]

Nurseries for the production of beachgrass clones should be situated on eroding sands because these sites are usually free from weeds and competing grass. As eroding sand is usually low in plant nutrients, N fertilizers are especially required. Inorganic fertilizers were found to be much more effective than organic fertilizers in increasing production. The N in organic fertilizers was apparently liberated more slowly than it was in inorganic fertilizers under the cool conditions of the coast. NH_4 compounds were much more effective than NaNO_3 as inorganic sources of N. There were no significant differences between $(\text{NH}_4)_2\text{SO}_4$ and ammonium phosphate when applied to supply equivalent amounts of N. Single applications of fertilizer were the most satisfactory. N at the rate of 40 lb./acre in one application and in the form of NH_4 compounds gave the greatest efficiency of production.

631.67 IRRIGATION

(See also Abs. Nos. 1712, 1885, 1906, 1933, 1939, 1940, 2019)

[1819] 631.67
RECHENTHIN, C. A. **Maintaining productivity of irrigated lands.** *J. Soil Water Conserv.* 3, 1948 (121-126, 133). [S.C.S. Fort Worth, Texas]

Practices that should be considered in developing a conservation programme for irrigated areas in Texas include the application of manure, organic residues and commercial fertilizers, the use of green-manure crops and soil-improving crops in the rotation, the control of salt accumulations, the most efficient method of applying water and the control of erosion.

[1820] 631.67 : 631.432.3
DELLENBACH, P. Des effets de l'irrigation sur la perméabilité des sols irrigués par le Syndicat du canal d'irrigation de Cavet (Hérault). [The effects of irrigation on the permeability of soils irrigated by the

Syndicate of the irrigation canal of Cavet (Hérault).] *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (269-273). [F.] [E.N.A., Montpellier]

The infiltration rate of one irrigated soil (containing 16% silt, 12% clay, 8% lime) fell steadily from 8.9×10^{-6} m./sec. in 1925 to 1.1×10^{-6} m./sec. in 1947, that of another, flinty soil (containing 30% silt, 23% clay, 3% lime) remained constant at 4×10^{-5} m./sec. from 1925 to 1939, then fell to 1.2×10^{-5} in 1947. This variation in permeability necessitates a variation, with time, in the irrigation regime of the soils.

631.8 FERTILIZERS

[1821] 631.81
JOHNSTON, J. C. **Let's re-examine the 1948 fertilizer dollar.** *Calif. Citrog.* 33, 1948 (135, 150). *Biol. Abs.* 22 (1457).

A popular account of the present fertilizer situation in California. N is deficient in most soils. Mn, Zn and Cu deficiencies are also found; these elements can be applied most effectively as sprays. The use of N, manure and cover crops is discussed.

[1822] 631.81
MANUFACTURING CHEMIST. **Fertilizers and plant nutrients.** *Manuf. Chem.* 19, 1948 (24-28). B.A.B.III, 1948 (156).

A progress report is presented in which the following are discussed: P fixation with special reference to silicophosphate, granulated super. and seed coating with K phosphates; fixation of N by use of an insoluble urea-HCHO resin; N-rich soluble fertilizers such as urea and NH_4NO_3 for irrigation fertilization; the use of KCl, NH_4NO_3 and CaCN_2 for mushroom composts; the use of waste products such as spent H_3PO_4 catalysts and waste sulphite liquor as fertilizers; Mn deficiency, and the storage qualities of fertilizers.

[1823] 631.81:34
TAYLOR, G. **Fertilizers and feeding-stuffs act and some analytical implications.** *J. Proc. Roy. Inst. Chem. Gt. Brit. Ireland* 1948 (1-21). C.A. 42 (6034).

The enactment of various laws has resulted in a classification and analysis of fertilizers

and foods. It is considered that the next necessary step is an analysis based upon availability rather than total contents.

[1824] 631.81:546.27
KATALYMOV, M. V. **[Boron content in fertilizers.]** *Dokl. Akad. Nauk. S.S.S.R.* 60, 1948 (1217-1218). C.A. 42 (6980).

Volumetric analysis of usual fertilizers for B gave the following average results: manure on straw backing 20.1-21.3 mg./kg.; peat 6.7-12.3; manure ash 67.7; peat ash 36.6; coal ash 41.6; dolomite 3.8-8.0; crystalline magnesite 4.5; amorphous magnesite 3.9; lumber ash 203-476; sylvinite 8.2; carnallite 6.3; polyhalite 12.3; crude K_2SO_4 3.7; crude Ca cyanamide 6.3; crude NH_4Cl 2.7; crude $(\text{NH}_4)_2\text{SO}_4$ 3.2; apatite super. 9.5; crude KCl, KNO_3 , NaNO_3 , NH_4NO_3 , urea 0.0. Estimates are made of B introduced by the various fertilizers under Russian practices. Peat contains B mostly in a water-insoluble form, hence its utilization must depend on mineralization.

631.811 PLANT NUTRITION

(See also Abs. No. 1741)

[1825] 631.811.2:619
CARBONEL, J.; PERIER. **La carence phosphorique des années de guerre dans ses rapports avec la production végétale, l'hygiène animale et la santé publique.** [The relationship of wartime phosphorus scarcity to plant production and animal and public health.] *C.R. Acad. Agric.* 34, 1948 (821-823). [F.]

A preliminary report on a study carried out by the Academies of Science, Medicine, Agriculture and Veterinary Science indicates the considerable effect on milk production, bone diseases and average weight of cattle due to the fall in P_2O_5 consumption from about 440,000 tons in 1939-1940 to 23,000 tons in 1944-1945.

[1826] 631.811.4:546.27:581.144.2
HAYNES, J. L.; ROBBINS, W. R. **Calcium and boron as essential factors in the root environment.** *J. Amer. Soc. Agron.* 40, 1948 (795-803). [Ohio and N.J. Agric. Expt. Stas.]

In crops on podzolic soils, with localized fertilizer placement, plants which do not send roots outside the fertilized zone usually

suffer or perish from insufficient moisture supply. In acid soils, root extension beyond the fertilized zone is adversely affected by the presence of such toxic substances as soluble Al.

Work with tomatoes, in which the lower stem and attached roots were split into "right" and "left" sides which were placed in a basal solution with or without Ca or B or both, confirmed that Ca is necessary to the maintenance of the functional integrity of root membranes and the accumulation of electrolytes by roots, and showed also that the co-presence of B is essential in the fulfilment of these functions of Ca. The successful growth of oats, maize, wheat, soybeans and lucerne with one part of the root in soil and the other in a solution of CaCl_2 + boric acid suggests that the results from the tomato experiment are of wide application. It is inferred that, except in special cases, maximum benefit would follow the incorporation of lime throughout the volume within which root occupation is desired.

[1827] 631.811.9: 546.27
DENNIS, R. W. G. **Boron and plant life—Part VI. Developments in agriculture and horticulture 1943-1946.** *Fert. Feed. J.* 33, 1947 (465-470, 493-498, 519-524, 549-555, 575-580, 611-614); 34, 1948 (71-77, 101-107, 137-140, 167-168).

Subjects discussed include the B content of various plants, organic and inorganic sources of B, B content of organic manures, Na and B standards for irrigation waters, B content of soils, factors affecting B availability in soils, the effect of excess and deficiency of B on various plants, and B and parasitic fungi.

631.813 PROPERTIES OF FERTILIZERS

[1828] 631.813
ALLEN, H. R. **Report on sampling fertilizers.** *J. Assoc. Off. Agric. Chem.* 31, 1948 (205-209). [Ky. Agric. Expt. Sta., Lexington]

Analyses of samples taken with single-core and double-core triers were in good agreement and samples from individual bags sampled in horizontal and vertical positions were uniform

in analysis, but the triers were not compared on mixtures with a tendency to segregate or on samples taken before and after segregation. Samples kept in paper bags for 4 to 6 days after sampling contained 1—1.5% less moisture than those sealed in glass jars when sampled.

631.82 MINERAL AMENDMENTS. LIME

(See also Abs. Nos. 1902, 2016)

[1829] 631.821: 669.16
LANDWIRTSCHAFTLICHE VERSUCHS- UND FORSCHUNGSANSTALT HOHENRODE. Einige Versuche mit kalkarmer Hochofenschlacke. [Experiments with calcium-deficient blast-furnace slags.] *Ztschr. Pflanz. Düng.* 38, 1947 (47-54). C.A. 42 (4700). [G.]

In 3-year pot experiments using acid sandy soils, the effect of 2 blast-furnace slags containing 35 and 46.6% of CaO on soil reaction and crop yields was compared with the effect of equivalent applications of CaCO_3 . On the average, higher potato yields were obtained with the slags, while CaCO_3 promoted potato scab. CaCO_3 was twice as effective as the slags on soil reaction, but, on colloid-deficient soils, slag aids in maintaining an optimum soil reaction.

[1830] 631.824: 545
HARDIN, L. J.; MACINTIRE, W. H.; JOHNSON, H. S., JR. A procedure for the determination of the "available" magnesium engendered in mixtures of superphosphate with olivine, serpentine, magnesite and their calcines. *J. Assoc. Off. Agric. Chem.* 31, 1948 (405-419). [Tennessee Agric. Expt. Sta.]

The method is considered suitable for the accurate determination of the available-Mg content of fertilizers. 1 gm. of 50-mesh sample is leached at room temperature with 100 ml. of 2% citric acid by decantation through a filter. The residue and filter pad are digested at 50°C with 100 ml. of extractant for 30 minutes by means of an end-over-end rotator and filtered and washed with 5-ml. portions of water at 65°C. Digestate and leachate are combined and diluted to 250 ml. A 10- or 25-ml. aliquot is placed in a 400-ml. beaker and the Ca separated as oxalate by double precipitation, the first of

which must take place in a solution of about 200 ml. containing the NH_4Cl formed by the neutralization of 10 ml. of concentrated HCl and the second in a similar way from a solution of 150-170 ml. The NH_4 salts in the combined filtrates are metathesized with HNO_3 and the resultant residue brought into dilute HCl solution. 2-3 gm. of citric acid are added to this solution to obviate the need for removal of Fe and Al. The extracted Mg is determined by the MgNH_4PO_4 method, complete precipitation being ensured by adding 25 ml. of concentrated NH_4OH , standing for 30 minutes, stirring violently and standing for 4 hours before filtration.

631.83 POTASSIUM FERTILIZERS

(See also Abs. No. 1848)

[1831] 631.83
TURRENTINE, J. W. The chemical composition of agricultural potash salts. *Fert. Feed. J.* 34, 1948 (533-538).

Analyses are given of various potash salts being distributed on the American market.

631.84 NITROGEN FERTILIZERS

(See also Abs. No. 1958)

[1832] 631.841.1 : 631.812
MANNING, J. Fertilizer ammonium sulphate crystals. XI. *Int. Cong. Pure Appl. Chem.* 1947 (165). B.A.BIII, 1948 (152).

The caking of small cube-like crystals of $(\text{NH}_4)_2\text{SO}_4$ is caused by the crystals sticking together at their points of contact due to production of a cement by the drying on them of a saturated $(\text{NH}_4)_2\text{SO}_4$ solution. A new method yields much larger cigar-shaped crystals; these are produced in an acid solution containing a tervalent ion, being grown to suitable size by keeping them for some time in contact with a supersaturated $(\text{NH}_4)_2\text{SO}_4$ solution; fewer points of contact are available, and consequently there is much less caking.

[1833] 631.842.4 : 545
ETHEREDGE, M. P. Report on nitrogen in fertilizers. *J. Assoc. Off. Agric. Chem.* 31, 1948 (236-242). [Miss. St. Coll.]

The following methods show possibilities for determining N in NH_4NO_3 ; (1) the Devarda procedure, (2) MgO distillation, (3) distillation with a small amount of NaOH and (4) the formaldehyde-titration method (see next abstract). Method (4) appears the simplest, and sufficient data exist to set it up as a tentative method, but more work and comparison are recommended before adopting it as official.

[1834] 631.842.4 : 545
MILLER, R. D. Method for rapid determination of total nitrogen in ammonium nitrate fertilizer. *J. Assoc. Off. Agric. Chem.* 31, 1948 (373-381).

The method presented has been thoroughly tested on NH_4NO_3 , is satisfactory for reproducible results, takes hardly longer than a determination of the strength of HNO_3 and is specific for NH_4 salts. Approximately 1.5 gm. of the sample are placed in a 50-ml. beaker, weighed ($= x$ gm.), dissolved in distilled water and transferred to a 250-ml. Erlenmeyer flask. 30 ml. of 20% HCHO (neutral to phenolphthalein) are added and the whole titrated with y ml. of z -normal NaOH with phenolphthalein until the addition of one drop of NaOH produces no colour change at the point of contact. The percentage of N $= 2.802 z y/x$.

631.85 PHOSPHATE FERTILIZERS

(See also Abs. No. 2011)

[1835] 631.85 : 545
JACOB, K. D.; RADER, L. F., JR.; WHITTAKER, C. W. Report on phosphoric acid. A. Effect of continuous agitation during citrate digestion on determination of citrate-insoluble P_2O_5 . B. Effect of sulfate on determination of P_2O_5 by the volumetric method. *J. Assoc. Off. Agric. Chem.* 31, 1948 (209-234). [Bur. Pl. Indust., Beltsville, Md.]

A. Continuous agitation during the citrate digestion tends to give lower values than the official method of manual shaking at 5-minute intervals, especially with samples relatively high in citric-insoluble P_2O_5 , but the differences are much smaller than those obtained on a given sample by different analysts using the same method of agitation. Continuous agitation saves time and attention,

tends to improve reproducibility and is worthy of adoption as an alternative to the present official method.

B. Removal of the SO_4 as the Ba salt followed by precipitation of the phosphomolybdate at $45-50^\circ$ with occasional stirring gives results generally agreeing with those from the official method in which the SO_4 is not removed and the precipitation is made at $25-30^\circ$ with constant stirring or shaking. The removal of SO_4 thus obviates the need for a shaking apparatus. The procedure is worthy of adoption as an alternative method.

[1836] 631.851
COX, T. R.; BAILEY, M. V. **Current trends in the use of rock phosphate for direct application.** *Amer. Fert.* 109, No. 3, 1948 (20). [Amer. Cyanamid Co., New York]

Finely ground phosphate rock may be used for direct application in long-term soil-building programmes on soils that are slightly acid, but not on neutral or alkaline soils. It is profitable on land where deep-rooted and other legumes are grown for about half the time and where supplemental fertilizers containing super. are used on row crops, small grains and most non-leguminous crops.

[1837] 631.851 : 631.81
JONES, U. S. **Availability of phosphorus in rock phosphate as influenced by potassium and nitrogen salts, lime and organic matter.** *J. Amer. Soc. Agron.* 40, 1948 (765-770). [Univ. Wisc., Madison]

The yield and chemical composition of rye were used to evaluate the influence of additions of KCl , $(\text{NH}_4)_2\text{SO}_4$, CaCO_3 and peat on the availability of the P in rock phosphate on a silt loam of pH 5. Soil pH had a greater influence than any other single factor on the P availability. Rye on a plot which had received 3 tons/acre of ground limestone took up 4.3 lb./acre of P_2O_5 , whereas unlimed rye took up 10.1 lb. $(\text{NH}_4)_2\text{SO}_4$ and KCl mixed with rock phosphate and added to the soil increased the P uptake by 285% over phosphate alone. Peat increased the yield by 10% but did not affect P or K uptake.

[1838] 631.855 : 539.215
MICHAEL, E.; KUHN, L. **Gefäßversuche zur Prüfung der Düngewirkung von gekörn-**

tem Superphosphat. [Pot tests of the fertilizing effect of granulated super.] *Ztschr. Pflanz. Düng.* 37, 1946 (167-175). [G.]

The yields were compared of oats and barley in pots receiving basal NK and P as normal super., basic slag or in the granulated form as Silesia phosphate with grains of size 1.5-4.5 mm. The soils were a loam, an acid sandy soil and a neutral sandy soil. The plants were harvested at 3 stages of growth in order to follow the course of P uptake. There were no important differences in the utilization of or yields from the different sources of P, although uptake from the granulated form was on the whole rather lower. With a following crop (mustard) the granulated form showed a considerably greater residual effect than the other sources, when the P applications were low.

[1839] 631.858
HILL, W. L.; WARD, F. N.; ARMIGER, W. H., ET AL. **Composition and fertilizer value of phosphate rock—magnesium silicate glasses.** *J. Assoc. Off. Agric. Chem.* 31, 1948 (381-397). [Bur. Pl. Indust., Beltsville, Md.]

The major constituents of 7 commercial glasses of this type were P_2O_5 (19.7-23.6%), SiO_2 (19.2-23.8%), CaO (28.3-35.5%) and MgO (11.5-18.5%); other constituents were Al_2O_3 (0.6-3.7%), FeO (1.9-3.8%) and F (1.6-2.2%). The effect of fineness on citrate solubility was greater with the glasses than with basic slag and fused alpha phosphate. Citrate solubilities of 60- and 300-mesh material were 52.8 and 86.8% for a glass and 86.7 and 91% for a slag. The glasses vary considerably in rate of crystallization when annealed below the melting point (1300-1400°C) and thus in content of apatite and in P solubility. They caused a marked loss of NH_3 when suspended in an aqueous solution of NH_4NO_3 . Glass-super. mixtures (20-80% super.) in indecisive tests showed continuous decreases in water-soluble P without progressive changes in citrate-insoluble P. In greenhouse tests with millet the response to the glasses (80-mesh or finer) was sometimes greater and sometimes less than that to double super. Coarse glass was always inferior to finely-ground, and a fineness exceeding 60-mesh is required for favourable comparison of the glass with double super.

631.86/7 ORGANIC FERTILIZERS

(See also Abs. No. 1897)

[1840] 631.86/7: 577.17
HAMENCE, J. H. **The effect of organic manures on the auxin content of soils and the "auxin-balance" in soils.** *J. Soc. Chem. Indust.* 67, 1948 (277-281). [Bernard Dyer & Partner's Lab., Eastcheap, London]

The rate of decomposition of β -indolyl acetic acid added to soils is very rapid. Normal dressings of dung and dried blood increase the auxin content of soils towards the maximum value. This increase may be maintained for some months and in dried-blood manures additional auxins are produced as a result of their decomposition in the soil. β -indolyl acetic acid is one of the auxins thus produced. Heavy dressings of organic manures may increase the auxin content of the soil considerably, but this increase is rapidly followed by a reduction to a value within the normal range. The facts suggest the existence of a mechanism within the soil to control the soil-auxin content within certain limits or suggest what is tentatively described as an "auxin-balance" in the soil.—From author's summary.

[1841] 631.86/7: 631.81: 631.811.6
BOULD, C.; CATLOW, E. **Studies on the comparative effects of dung, compost and inorganic fertilizers on crops and soil. I. Effects on yields and composition of potatoes and cauliflower.** *Long Ashton Agric. Hort. Res. Sta. Rept.* 1947, 1948 (61-70).

A manurial experiment was laid down in 1945 on land deficient in Mg to compare dung and straw compost with inorganic fertilizers. The soil was a pale reddish-brown non-calcareous heavy sand overlying fine sand or sandy silt, with drainage slightly impeded. In the first two years, manurial treatments had no significant effect on cauliflower yield, but affected the incidence of Mg deficiency. In 1945, plants receiving dung and compost only had pale foliage indicating N deficiency. NPK was better than compost + NPK. Mg-deficiency symptoms were most severe with compost and least severe with NPK. Plants also showed signs of B deficiency, which was most severe with NPK and least severe with compost. In 1946, Mg-deficiency symptoms were still most severe with com-

post and were least severe with dung. In 1947, plots receiving compost only were least vigorous and showed most marked Mg-deficiency symptoms. The healthiest plants were on plots receiving NPK + compost, and NPK alone. Yields were 58.3 lb. with NPK, 54.7 lb. with dung, 59.8 lb. with compost and 64.3 lb. with compost + NPK. Mg content of leaves was 0.471 with NPK, 0.466 with dung, 0.415 with compost and 0.437 with compost + NPK.

[1842] 631.86
IVERSEN, K.; DORPH-PETERSEN, K. Forsøg med Stalgødnings Opbevaring og Anvendelse. 1936-46. [Experiments with the preparation and use of farmyard manure, 1936-46.] *Tidsskr. Planteavl* 52, 1948 (69-110). [Da.]

[1843] 631.874
BEAR, F. E. **Making compost in the soil.** *J. Soil Water Conserv.* 3, 1948 (131-132, 138). [N.J. Agric. Expt. Sta., New Brunswick]

Good compost can be made in the soil by ploughing under a green manure crop. If cornstalks, straw or other low-nitrogen non-leguminous crop wastes are ploughed under, top dressings of 125-250 lb. of cyanamid per ton dry weight should be added before ploughing in the crop.

[1844] 631.875: 631.871
ACHARYA, C. N. **Composting vs. direct ploughing in of refuse materials.** *Indian Farm.* 9, 1948 (125-126). [Min. Agric., New Delhi]

Trials have shown that under certain conditions the addition of uncomposted refuse (urban and rural) to the soil benefits the succeeding crop. Refuse containing weed seeds should be composted so as to generate enough heat to destroy the seeds. Crop yields may be lowered by indiscriminate application of straw and sugarcane trash because of their wide C/N ratios. Large quantities of undecomposed straw or town refuse use all available moisture for their own decomposition in soils receiving low to medium rainfall. Such refuse should be used only on land under irrigation or where rainfall is over 50 inches and well distributed.

[1845] 631.875 : 632.556.7
 DYMOND, G. C. **An item in conservation.**
Proc. Ann. Cong. S. Afric. Sug. Tech. Assoc.
 1947 (101-103). Hort. Abs. 18 (137).

The suggestion is made that the water hyacinth, *Eichhornia crassipes*, which has a very rapid rate of reproduction, should be used in Natal as perhaps the only practical instrument for recovering some of the vast quantities of plant nutrients at present lost in drainage waters. The weed could be dragged to the river banks and composted there. Figures are provided of the composition of the plant under different conditions, and of its NPK content in unit values.

[1846] 631.876.9
 HAMENCE, J. H.; TAYLOR, G. **Experiments on the toxicity of a chrome-bearing fertilizer to plants, including a brief survey of the literature on chromium toxicity.** *Fert. Feed. J.* 34, 1948 (449-453, 477-480).

Cr is present in substantial quantities in some infertile areas but it has not been proved conclusively that the Cr and no other factor is responsible for the infertility. Soluble Cr salts, particularly bichromates, if present in sufficient quantity are toxic to plant growth, but traces of soluble Cr salts have a stimulating effect on plant growth. An industrial residue, known as chrome material, when tested contained no soluble Cr salts, and the large proportion of alkali it contained should prevent the production of soluble salts in a normal soil. The toxicity of chrome tanning waste liquors is ameliorated by heavy dressings of lime. A heavy dressing of 10 tons/acre of chrome material would add <0.02% of Cr to the soil. Application of 8½ tons/acre followed by several top dressings of chrome material had no toxic effect on tomatoes in a greenhouse. Similar applications to a moderately heavy neutral clay and to a soil of pH 5.5 growing market-garden crops in the field produced no signs of toxicity.

Toxic effects are more likely in strongly acid soil than in a neutral one and such effects are largely nullified by high lime content or the application of lime. Chrome material contains Mg which neutralizes acid soil. When the alkaline Mg constituents were first neutralized and 8½ tons/acre of the material were then used on acid soils of pH

4.0 and 4.8 together with 11 cwt./acre of super. and 5½ cwt./acre of muriate of potash, there was no evidence of toxicity due to Cr, and the general growth of young plants was equivalent to that of plants grown in similar soil to which dried blood and MgSO₄ had been added. The crops were not grown to maturity. Data show that plants grown in soil to which chrome material had been added contained small quantities of Cr, but there is no evidence of substantial uptake of Cr by plants from such soil.

[1847] 631.879.2
 ROWNTREE, J. B. **Sewage treatment in New Zealand.** *Surveyor* 106, 1947 (527-529, 545-546). C.A. 42 (6028).

A comparison of current practice in New Zealand with that in Britain. The addition of 6 lb. of (NH₄)₂SO₄, 12 lb. of super. (44-46%) and 4 lb. of K₂SO₄ per 100 lb. of digested sludge (dry weight) is suggested as providing a balanced fertilizer.

[1848] 631.879.3 : 631.831
 MARTORELL, J. L. **Fertilizers from vegetable waste products.** *Afinidad* 24, 1947 (206-212). B.A.BIII, 1948 (198).

The use of wood ash, lignin, and mixtures of sawdust, wood shavings and super. with farmyard manure is discussed.

632 PLANT DISEASES. WEEDS AND PESTS. PLANT PROTECTION

(See also Abs. Nos. 1876, 1881, 1883, 1891, 1893, 1906, 1918, 1923, 1924, 1938, 1941, 1955, 1960, 1961, 1964)

[1849] 632 : 631.582
 LARSEN, H. **Växtföljden och växtsjukdomarna. [Rotation and plant diseases.]** *Fors. Forskn.* 5, 1948 (14-15). Herb. Abs. 18 (191). [Sw.]

A tabulated statement gives a survey of the most important diseases in agricultural plants and indicates the susceptibility of the different crops. When clover fields in Denmark become infected with clover eelworms an interval in clover cultivation of 7-8 years is necessary to free the soil of the pest.

[1850] 632.111 : 631.81
IVANOV, V. V. **The influence of potassic and phosphatic manures on the resistance of spring crops to cold.** *Sovet. Bot.* 5/6, 1941 (84-86). *Biol. Abs.* 22 (1440).

The manures applied either in the ordinary way or in solution to seedlings rendered beans, lentils, soya beans, peas, millet, sorghum, buckwheat, tomatoes, cucumbers, wheat and water melon resistant to cold.

[1851] 632.191 : 631.81
WIEBOSCH, W. A. Het optreden van chlorotische verschijnselen in Noord-Holland benevens het opsporen en opheffen daarvan. [**Chlorosis in North Holland : its identification and control.**] *Meded. Direct. Tuinb.* 10, 1947 (556-565). *Hort. Abs.* 18 (98). [D.u.e.]

Vegetable and fruit crops on more or less calcareous soils are suffering from lime-induced chlorosis, mainly due to shortage of Fe and Mn. The chlorosis has occurred since organic manures have been largely replaced by artificials. The diagnostic methods elaborated at the East Malling and Long Ashton research stations in England are discussed in relation to their adoption in Holland.

[1852] 632.2 : 632.953
NELSON ESTRADA, R.; FERNANDO VILLAMIL, G. Experimento de campo sobre el control de nematodos a base de D-D. [**Field experiments on the control of nematodes with D-D.**] *Notas Agronomicas* 1, No. 1, 1948, pp. 5. [Sp.e.] [Palmira Agric. Expt. Sta., Colombia]

D-D was injected at intervals of 40 cm. at the rates of (a) 300, (b) 200 and (c) 100 lb./acre in a soil heavily infested with *Heterodera marioni*. The results so far show significant differences in tomato yields at the 5% level between treatments (a) and (c) but not between (a) and (b). There were no significant differences in the number of plants with nematode-infected roots.

[1853] 632.2 : 632.953
TOWNSEND, G. R. **Root knot control for muckland celery in Florida.** *Down to Earth* 4, No. 2, 1948 (6-7).

Annual applications to the soil of 15-20 gallons/acre of ethylene dibromide kills root-

knot nematodes in heavily infested fields and increases celery yield. Equipment for fumigating the soil is described.

632.5 WEEDS

(See also Abs. Nos. 1811, 1874, 1898)

[1854] 632.554.22
AUSTRALIA. COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH. **Weeds investigations—nutgrass.** *Aust. Counc. Sci. Indust. Res. Rept.* 1946-47, 1947 (12-13).

In a dry consolidated silty soil, injections of chloropicrin at rates of 500 and 1000 lb./acre killed nutgrass (*Cyperus rotundus*). Lower rates of application may be effective. D-D was effective at 1000 lb./acre, but not at 500 lb. 1% Methoxone dust at 500 lb./acre was the most effective treatment in tests at Canberra.

[1855] 632.576.5 : 546.27
HARTMAN, H. J.; OFFORD, H. R. **The eradication of poison-oak at Camp Adair, Oregon.** *J. Forestry* 45, 1947 (105-112). [U.S.D.A.]

In the eradication of poison-oak (*Rhus diversiloba*) from 17,000 acres, bulldozers equipped with a special brush rake were used for heavy concentrations of the plant. Light infestations were grubbed with Pulaskis and wide-bladed hazel hoes. After removal of the poison-oak dry borax was applied at the rate of 10-15 lb./milacre. A year after treatment there was no significant damage to neighbouring oaks but occasional injury to hazel brush and maple was noted. The B content of the top three inches of a heavily treated area was reduced from 9000 p.p.m. to 75 p.p.m. of borax after a year.

[1856] 632.582.4 : 632.954 : 577.17
NICHOLSON, R. M. **Dangerous weed checked.** *Farm. Week. S. Africa* 75, August 18th, 1948 (109, 111).

St. Johns Wort, *Hypericum perforatum*, which tolerates drought and poor soil, is effectively controlled by 2,4-D spray.

632.7 INSECT PESTS

(See also Abs. Nos. 1899, 1922)

[1857] 632.7: 546.23
FARRAR, M. D. The use of sodium selenate on greenhouse bench soil for the control of plant pests. *Rept. First Cong. Plant Prot. Haverlee, 1946, 1947* (416-417). R.A.E. 36A (290).

When soil was treated with 0.25 gm./sq. foot of Na selenate before planting carnations, red spider (*Tetranychus*) did not develop on most plants. Soils that received 0.125 gm./sq. foot of selenate in July required further treatment in February and those that received 0.25-0.5 gm. required further treatment in March. Na selenate applied at 0.5 gm./sq. foot to chrysanthemum soon after planting controlled *Tetranychus*, mealybugs and thrips but gave only fair control of aphids and chrysanthemum midge. 0.5 gm. damaged gladiolus and *Antirrhinum*.

[1858] 632.7: 546.23
FULLER, G. Selenium compounds in greenhouse pest control. *Rept. First Int. Cong. Plant. Prot. Haverlee, 1946, 1947* (411-415). R.A.E. 36A (289).

Soil treatment with selenate controls some greenhouse pests, particularly red spider (*Tetranychus*) and aphids, which are poisoned by the Se in the plants. 0.5 gm. and more of Na selenate per sq. foot almost completely eliminated *Tetranychus*; thrips were not completely controlled but damage by them was materially reduced. There was no plant injury due to Se even at doses of more than 1 gm./sq. foot. 0.2 gm./sq. foot of selenate applied with 5-9 lb. of limestone per 100 sq. feet gave excellent control of aphids, but injured the lower leaves of plants. With 0.2 gm./sq. foot of selenate in 5-9 lb. of gypsum per 100 sq. feet, control was only partial. The best treatment for aphid control was 0.4 gm./sq. foot of selenate applied in gypsum, which reduced the absorption of Se by the plant by 50% and reduced the toxic effects of the Se absorbed.

[1859] 632.7: 631.461.74
WHITE, R. T. Application of milky-disease spore dust with a commercial fertilizer. *J. Econ. Ent.* 41, 1948 (113-114).

A mixture of 400 lb. of 10-6-4 fertilizer and 24½ lb. of spore dust of type-A milky disease

(*Bacillus popilliae*), to which scarabeid larvae are susceptible, was applied to an acre of turf by means of a fertilizer spreader. After 1 and 2 years the treatment reduced the numbers of larvae and increased the percentage of those infected by the disease.

[1860] 632.7: 631.51
HAMMOND, G. H. The distribution, life-history and control of *Phyllophaga Anxia* Lec. in Quebec and Ontario. *Sci. Agric.* 28, 1948 (403-416). [Dept. Agric., Ottawa]

Shallow ploughing and multiple discing of the soil before the second-year grub injury is recommended as the principal control measure to destroy the grubs of June beetle before their most injurious phase. Injury can be avoided by short rotations, growing susceptible crops in heavier soils, the use of clovers instead of timothy and by clean culture. DDT and benzene hexachloride are promising soil treatments. Volatile soil fumigants such as methyl bromide, chloropicrin and DD give effective control but are costly.

[1861] 632.765: 632.953
JONES, F. G. W. Wireworm: its habits and control. *Brit. Sug. Beet Rev.* 17, 1948 (23-27). [Sch. Agric. Cambridge]

Heaviest wireworm populations are found in old grassland. When the grass is broken the wireworms attack arable crops for 3 years, the damage being worst in the first and second years and then declining. 1½ cwt./acre of 3½% benzene hexachloride worked into the seedbed the first year after breaking up the grassland gives effective control of wireworms in cereals and sugar beet.

[1862] 632.765: 632.954: 557.17
FOX, W. B. 2,4-D as a factor in increasing wireworm damage of wheat. *Sci. Agric.* 28, 1948 (423-424). [Dept. Agric. Ent. Lab., Saskatoon]

In 2,4-D-treated plots seeded on June 2, the number of seeds failing to germinate due to wireworm (*Ctenicera acripennis destructor* Brown) injury was 3 times as great as on a control plot receiving no 2,4-D. Crops seeded on June 17 and July 3 suffered little damage, presumably because they were sown after the period of maximum wireworm

activity. On plots treated with 1 and 2 lb./acre, germination and growth of wheat seeded on May 16 and June 2 were retarded. About 30% of the emerged plants were killed by wireworms, whereas only 5% were damaged in the control plot. By retarding germination and plant growth, the 2,4-D was instrumental in increasing wireworm damage.

632.95 INSECTICIDES.

FUNGICIDES. HERBICIDES

(See also Abs. Nos. 1900, 1904, 1909, 1911, 1921, 1960)

[1863] 632.951
BUSSART, J. E.; SCHOR, A. **Chlordane**. *Soap* 24, No. 8, 1948 (126-128). [Velsicol Corp., Chicago]

Chlordane or Velsicol 1068, of empirical formula $C_{10}H_6Cl_8$, can act as a stomach, contact or fumigant poison, but causes little or no injury to plants, while its toxicity to human beings is about the same as that of DDT, weight for weight. It is, however, used in smaller concentrations than DDT. Tests of chlordane as a soil insecticide suggest that $2\frac{1}{2}$ lb./acre of active ingredient worked into the soil will give 100% control of wireworms, while Japanese-beetle larvae have been controlled by 10 lb./acre. Mole crickets in golf greens of southern States have also been controlled and most species of cutworm appear to be killed by a surface-soil application. Some physical and chemical properties and sample formulations for the manufacture of dusts, wettable powders and emulsions are described. Chlordane loses strength when mixed with substances of alkaline reaction.

[1864] 632.953
JACKS, H. **D-D for disinfecting soil**. *Orchard. N.Z.* 20, No. 3, 1947 (8-9). Hort. Abs. 18 (110).

Potting soil in bulk and soil in place in glasshouses and out of doors may be treated by injection of 3-5 ml./square foot at a depth of 5 to 8 inches. The soil should be left for 48 hours and then forked or disced for aeration and left for at least 3 or 4 weeks before planting. D-D should not be applied within 2-3 feet of living plants. In potting soil treated in airtight containers it ensures a 60% control of damping-off and wilt diseases and kills 30% of the weed population.

[1865] 632.953
CAWTHRON INSTITUTE. **Tests with steam and soil disinfectants**. *Cawthron Inst. Rept.* 1947-48, 1948 (21, 27).

Chloropicrin at the rate of 36 c.c./square yard gave as good results as steam treatment. DD at 25 c.c./sq.yd. was slightly less effective. Results with formalin were decidedly inferior to those obtained with steam. Gammexane gave good results in the early stages of plant growth, but results were less good as the plants developed. Yields of tomatoes from different treatments were: steam 7.5 lb./plant, chloropicrin 7.7, formalin 5.9, DD 7.4, Gammexane 6.5 and control 5.2. Quality of fruit was as good with chloropicrin and DD as with steam treatment.

Experiments in tobacco-seedling beds showed that chloropicrin at 6 c.c./sq.foot controlled black root-rot, producing over 90% of healthy plants compared with 40% in control plots. Weeds are more completely suppressed with steam sterilization than with chemical treatment.

[1866] 632.953 : 547.281.1
JACKS, H. **Formalin—a soil fungicide**. *Orchard. N.Z.* 20, No. 6, 1947 (2-3). Hort. Abs. 18 (110, 111).

Formalin has been used successfully as a soil fungicide when applied at the rate of 50 gallons of a 1 in 50 solution to 15 square yards of soil surface. Failure may result from the formation of paraformaldehyde on storing and cloudy formalin solution should be applied at concentrations of up to 2 in 50.

[1867] 632.953 : 631.3
JACKS, H. **Implements for soil disinfection**. *Orchard. N.Z.* 20, No. 4, 1947 (10-12). Hort. Abs. 18 (111).

Apparatus developed to secure satisfactory distribution of soil fumigants include machines for treatment of large areas in and out of doors and a simple hand-operated injector.

[1868] 632.953 : 631.416
CAWTHRON INSTITUTE. **Effect of steam and soil disinfectants on the plant food status of tomato soil**. *Cawthron Inst. Rept.* 1947-48, 1948 (13-14).

Steam treatment on typical tomato soils makes no significant difference to the amounts of exchangeable lime, Mg and K

present in the soil, but the effect on N was marked. On unsterilized soil, applications of N as $(\text{NH}_4)_2\text{SO}_4$ and dried blood changed rapidly to nitrate. With steam sterilization the production of nitrate was delayed for 6 weeks and with 4 c.c. of chloropicrin per 26 lb. of soil, nitrate production was delayed 3 months. The use of DD delayed still further the conversion of ammonium compounds to nitrate. Pot experiments with tomatoes in chloropicrin-treated soil showed that plants grew faster when N was supplied as nitrate than as ammonium compounds.

[1869] 632.953.005
JACKS, H. **A useful soil injector.** *Orchard. N.Z.* 20, No. 1-2, 1947 (8-9). Hort. Abs. 18 (III).

An instrument for injecting volatile disinfecting liquids, such as chloropicrin, Shell DD, CS₂, etc. into the soil is described.

[1870] 632.954
DANIELSON, L. L. **Selectivity of 2,4-D and Sinox when applied to soil.** *Plant Physiol.* 22, 1947 (635-636). [Truck Expt. Sta., Norfolk, Va.]

Selectivities of Sinox and 2,4-D are very similar when applied to the foliage of growing plants. When applied to soil which was not cultivated for 7 weeks after application, 2,4-D was toxic to both grasses and broad-leaf weeds, but Sinox was only slightly toxic to grasses and very toxic to broadleaf weeds. Bush Lima beans and sweet corn, planted in adjacent plots 10 days after the chemicals had been applied to the soil, grew normally.

[1871] 632.954 : 631.3
AKESSON, N. B.; HARVEY, W. A. **Equipment for the application of herbicides.** *Agric. Engng.* 29, 1948 (384-389). [Agric. Expt. Sta., Davis, Calif.]

[1872] 632.954 : 631.3
BARGER, E. L.; COLLINS, E. V.; NORTON, R. A., ET AL. **Problems in the design of chemical weed-control equipment for row crops.** *Agric. Engng.* 29, 1948 (381-383, 389). [Iowa Agric. Expt. Sta. and U.S.D.A., Ames, Iowa]

[1873] 632.954 : 631.3
MACDONALD, W. P. **Field spraying equipment for weed control.** *Agric. Engng.* 29, 1948 (390-393). [Agric. Dept. F. H. Peavey & Co., Minneapolis, Minn.]

633.1 CEREALS

(See also Abs. No. 1995)

[1874] 633.1-1.514
SACK, H. **Weed control in grain fields with the flexible harrow.** *Agric. Engng.* 29, 1948 (352, 354).

The universal flexible harrow formed of 3 flexible harrows with tines of 1.5 lb., 1.1 lb. and $\frac{3}{4}$ lb. respectively has no rigid frame and each tine contacts the soil surface with its own weight only. The germinating grain field may be harrowed from the moment of drilling until about $\frac{1}{3}$ of the sprouts have emerged and are forming their first leaf. From this point, the harrow must not be used until after the second leaf is fully developed, when it becomes safe to harrow until the grain is about 15 inches high. With tractor-drawn flexible harrows 30 ft. wide, 140 acres have been harrowed in a day.

The implement operates over a wide range of soil conditions but may puddle wet plastic soil. It may be used on potatoes before emergence and when 2 inches above ground; on beet with the medium or light section before emergence and on beans and other legumes before and after emergence. It may be especially useful where grain is harvested by combine, when weed seeds in large numbers are dropped with the chaff on the fields.

[1875] 633.1-1.53
LEMMERMANN, O. **Zur Frage des Tiefpflanzverfahrens. [Concerning the deep-transplanting procedure.]** *Ztschr. Pflanz. Düng.* 37, 1946 (176-178). [G.]

In view of some resurrection of faith in this procedure, the results are reviewed of widespread investigations carried out in 1908-1911 to test the methods originated by Demtschinsky in which cereal plants are (1) subjected to deep transplanting from or in seed beds or (2) earthed up in their drill-rows. All the reports reject method (1) on grounds including high labour cost, lower yields, lengthening of the growth period and unfavourable conditions of soil and climate. Some workers reported good, and others poor results for (2) as also for the method of drilling into furrows.

[1876] 633.I-2.4-I.584
GARRETT, S. D.; BUDDIN, W. **Control of take-all under the Chamberlain system of intensive barley growing.** *Agriculture* 54, 1947 (425-426). [Rothamsted and N.A.A.S., S.-E. Province]

Take-all disease can be controlled by encouraging vigorous growth of the cereal plant by liberal use of artificial fertilizers and by discouraging the activity of the fungus, *Ophiobolus graminis*, by preparing a firm seed bed and avoiding overliming. Drying out of the fungus present on infected roots and stubble left in the soil after harvest should be accelerated. It is difficult on light-textured alkaline soils to control take-all in consecutive crops of autumn-sown wheat, but with spring-sown cereals the interval between harvest and drilling is long enough to allow the fungus to die.

The Chamberlain system consists in sowing barley simultaneously with a seed mixture of 10 lb. of trefoil (*Medicago lupulina*) and 10 lb. of Italian ryegrass per acre, or 20 lb./acre of trefoil. After barley harvest the trefoil crop is ploughed-in in late autumn or early winter. The actively growing trefoil takes up all available soil N in autumn and so hastens the starving out of the take-all fungus. The N liberated during decomposition of the ploughed-in trefoil benefits the next barley crop and helps it to escape attack by surviving take-all fungus.

[1877] 633.I-2.7-I.81
ROZSYPAL, J. Roztoc kořanovy-škudce lešních ozimu. [*Rhizoglyphus echinopus*, a pest of winter wheat and rye.] *Ochrana Rostlin* 18, 1942 (76-77). *Biol. Abs.* 22 (1476). [Pl. Path. and Protect. Res. Inst., Brno]

This mite was abundant in fields of wheat and rye in 1941, especially on heavy soils, and acted as a vector of soil diseases. Artificial fertilizers should be used early in spring to improve the resistance of the plants. 50-100 kg./acre of each of calcium cyanamide and kainit were successfully used against the mite.

[1878] 633.I-2.953
JENKINS, W. A. **A root-rot disease-complex of small grains in Virginia.** *Phytopath.* 38, 1948 (519-527). [Tobacco Res. Lab., Agric. Expt. Sta., Chatham, Va.] *Pratylenchus* spp., a *Panagrolaimus* sp. and a *Ditylenchus* sp. occurring in soils mutilate

the roots of small grains and initiate a series of physiological and morphological host reactions which result in root-rot disease-complex. With rising soil temperatures other biological agents enter the injured tissue and extensive root-rotting occurs. Soil fumigation in conjunction with development of small grains which will produce vigorous root systems may control the disease.

[1879] 633.II-1.416: 581.192
ERCOLI-BATI, M. La composizione chimica del suolo ed il glutine. [**The chemical composition of the soil and the gluten content of wheat.**] *Ital. Agric.* 78, 1941 (546-548). *Biol. Abs.* 22 (1441).

Five soil types were compared of which humus, K, P and N contents were determined. The soil quality was indicated by an index number, and a positive correlation between gluten percentage and index numbers was obtained.

[1880] 633.II-1.811.91: 581.192
SILVELA Y DE TORDESILLAS, F. Iniciación al estudio del rendimiento unitario y calidad de los trigos en relación con el régimen de humedad. [**Introduction to a study of the yield and quality of wheat in relation to moisture.**] *Bol. Inst. Investig. Agron. Madrid* No. 18, 1948 (181-186). [Sp.f.e.g.]

Wheat plants in lysimeters were submitted to treatments involving varied fertilizing and scarcity or sufficiency of water. The preliminary conclusion is that the best results from the point of view of yield and quality are obtained by an increase in soil moisture between the times of shooting and heading, with the addition of KCl.

[1881] 633.II-2.4
BUTLER, F. C. **Take-all of wheat.** *Agric. Gaz. N.S.W.* 59, 1948 (248-250).

Take-all attacks the roots and stem bases of wheat, barley, rye and a number of grasses, but oats are resistant and are especially valuable as a rotation crop on infested land. Even though wheat be grown on infested land, take-all may not develop unless soil texture, physical conditions and soil reaction are suitable. In Australia the disease is serious in light, poorly compacted soils, in new land previously under grass, in alkaline soils, in soils where fallowing or rotation with oats has not been practised, in land

previously in lucerne for some years, in irrigated soils and during seasons of very low or very high rainfall. The fungus, *Ophiobolus graminis*, lives in the soil on infected wheat stubble or grasses. On well-worked fallow the fungus is largely killed by antagonistic soil-inhabiting organisms which multiply rapidly in well cultivated land. Successive crops of wheat should never be grown on infected land; fallow-wheat-oats rotation should be practised, the fallow land being kept clean of all grasses susceptible to take-all. Ploughing should be avoided when land is dry and dusty. Late fallowing distributes the fungus present in the stubble and grasses, and early fallowing is recommended. Burning off is not necessary unless take-all infection is extensive, as it leads to a rapid depletion of humus and aggravates erosion problems. The use of super., which helps the young plant to become well established, is recommended.

[1882] 633.11-2.4-1.811
EL-HELALY, A. F. **The influence of cultural conditions on flag smut of wheat.** *Phytopath.* 38, 1948 (688-697). [Farouk I. Univ., Alexandria, Egypt]

Deep sowing and moist soil at sowing increased the development of flag smut in wheat in Egypt. When the soil had dried out for 40-50 days before sowing and water was added only at sowing time the delay in germination of the smut spores gave less opportunity for infection of wheat seedlings. All manures tried in an experiment increased the incidence of the disease. Applications of farmyard manure and of lime at 10 cwt./acre increased infection. Super. had no effect on the disease. Deficiencies of Ca, N and K decreased the severity of the disease and P and Mg deficiencies increased it.

[1883] 633.11-2.4-1.84
HEBERT, T. T.; RANKIN, W. H.; MIDDLETON, G. K. **Interaction of nitrogen fertilization and powdery mildew on yield of wheat.** *Phytopath.* 38, 1948 (569-570).

N topdressing of wheat in early spring in North Carolina increased the amount of powdery mildew. Experiments with N applied at different times on plots where mildew was controlled by dusting with S were carried out on a sandy loam soil, low in N and to which P, K, Ca and Mg had been added. Dusting had little effect on yield where no N was applied or where 45 lb. of

N was applied at seeding in October, but when this amount of N was applied as a top dressing in spring the dusted plots yielded 40% more than the undusted plots. An application on February 1 gave a significantly higher yield than an application on March 1 on dusted plots, but the yield was slightly lower on the dusted plots. The use of N at seeding gave as high a yield as did its application in March on undusted plots, but gave lower yields on dusted plots. Thus the presence of mildew on wheat may affect both the optimum time for application of N and the response to N.

[1884] 633.14-1.4
SCHABEN, L. J. **Rye—a source of daily bread.** *Foreign Agric.* 12, 1948 (163-168). [OFAR]

Rye tolerates excessive moisture better than wheat, endures deficient moisture just as well and the newly planted crop makes less demand on subsoil moisture. It stands considerable degrees of soil acidity and alkalinity and removes less N from the soil than any other important grain. It succeeds on old exhausted soils and on peaty soils, moors and sandy soils and can be grown in many areas where the prevalence of disease and pests makes wheat a hazardous crop.

[1885] 633.15-1.67
RICHARDSON, J. B. **Irrigation of corn in the Piedmont.** *Agric. Engng.* 29, 1948 (353-354). [Clemson Agric. Coll.]

2 acres of sandy loam of above average fertility were used, the moisture availability and requirement being indicated by Bouyoucos blocks. The maize yields of (a) irrigated and (b) non-irrigated plots in 1946, with high rainfall during the most of the growing season, were 138 and 113 bushels/acre, while in 1947, when rainfall was low, the yields were 110 and 22 bu./acre with a 42-inch row spacing, and 83 and 14 with a 21-inch spacing. Silage yields in 1946 were with (a) 34 and (b) 24 tons/acre and in 1947 were 36 and 16 tons/acre. The lack of uniformity in total available moisture, due to irregular spray distribution, did not appear to affect maximum yields.

[1886] 633.15-1.81
VITUM, M. T. **Effect of nitrogen on corn in western New York in 1947.** *J. Amer. Soc. Agron.* 40, 1948 (657-659). [N.Y. St. Agric. Expt. Sta.]

Plots on a gravelly loam of pH 5.3 were treated 57 days before sowing maize with (a) $(\text{NH}_4)_2\text{SO}_4$ at 250 lb./acre and (b) at 500 lb./acre, (c) 1000 lb./acre of 10-10-10 and (d) as (c) plus ground limestone at 6000 lb./acre. Another plot was treated with $(\text{NH}_4)_2\text{SO}_4$ at 500 lb./acre 34 days before sowing (e). The season was unusually wet. Yields in bu./acre were: (a) 42.7, (b) 51.4, (c) 49.2, (d) 51.2, (e) 51.8 and control, 37.4. These responses were obtained in spite of the inadequate stand of 7,900 plants per acre and an early killing frost.

[1887] 633.18-1.671
JONES, P. H. **Rice irrigation with ground water in southwestern Louisiana.** *Rice J.* 50, No. 3, 1947 (11-14). Biol. Abs. 22 (1442).

In the irrigation of rice in Louisiana normally about 2.2 acre-feet of water must be added to supplement rainfall. The purpose of the investigation was to provide rice farmers with data to enable them to forestall local well failures and to determine the quality of the ground water that is perennially available for irrigation of rice in S.-W. Louisiana.

[1888] 633.18-1.816.32
WALKER, R. K.; STURGIS, M. B. **Fertilizers and methods of applying fertilizers to rice in Louisiana.** *Rice J.* 50, No. 1, 1947 (17-19). Biol. Abs. 22 (1444).

In 1945-46 and 1946 N, P_2O_5 and K_2O each applied at the rate of 24-30 lb./acre increased yields by about 25 bu./acre. Top dressing gave less consistent results than applications below the seed. Application of 200 lb./acre of 4-12-8 below the seed followed by a top dressing of 24 lb. of N just before booting gave good increases in yield. Fertilizer placed below the seed was more effective than when applied with the seed.

[1889] 633.18-1.84
WYCHE, R. H. **Nitrogen fertilizers for rice.** *Rice J.* 50, No. 4, 1947 (18-19). Biol. Abs. 22 (1444).

Both $(\text{NH}_4)_2\text{SO}_4$ and cyanamide applied at different dates and rates materially increased rice yields. Best results were obtained by applying 200-300 lb./acre of fertilizer at seeding time.

[1890] 633.18-1.84 : 629.135.2
WHITLOW, S. **Nitrogen fertilizer used as a top dressing for better yields in Texas.** *Rice J.* 50, No. 3, 1947 (28). Biol. Abs. 22 (1444).

The fertilizer Aero-Cyanamid, containing 20.6% of N, has been successfully applied by plane at the rate of 100 lb./acre. The application should be made when the rice is 4-8 weeks old and both ground and rice are dry (no dew), and the field should be flooded after the application. Yields have been increased by 3 barrels/acre.

[1891] 633.18-2.4 : 546.56
HASHIOKA, Y. **On the rot-disease (so-called cold injury) of rice seed in Formosa.** *Formosan Agric. Rev.* 27, 1941 (329-345). R.A.M. 27 (446). [J.e.]

Cold injury of rice seedlings results from attack by *Achlya* sp. when the normal growth of the seedlings is checked by low temperatures. Injury may be controlled by (1) dissolving CuSO_4 in irrigation water to obtain a concentration of 0.0025%, (2) pouring 2% CuSO_4 solution into the soil at the rate of 10 l./are, (3) coating seeds with 2% solution of CuSO_4 and potassium ferrocyanide.

[1892] 633.18-2.4 : 546.56
FUKUSHIMA, S. **Effect of copper sulphate on susceptibility of rice to *Helminthosporium* disease.** *Ann. Phytopath. Soc. Japan* 11, 1942 (162-171). B.A.BIII, 1948 (206).

Seedlings grown in soil to which CuSO_4 was added were less diseased than control plants. Growth of *Ophiobolus miyabeanus*, the causal fungus of *Helminthosporium* disease, was less vigorous in soil containing CuSO_4 than in soil without it.

[1893] 633.18-2.4-1.436
HASHIOKA, Y. **Studies on rice blast disease in the tropics. IV. Influence of temperature of air and soil upon the resistance of the rice plants to the blast disease. VII. Influence of temperature on the blast resistance of rice plants grown under different nutritional conditions.** *J. Soc. Trop. Agric.* 15, 1943 (53-65); 16, 1944 (163-176). R.A.M. 27 (445). [J.e.]

Resistance to rice blast (*Piricularia oryzae*) increased with increase in air and soil temperature. This seems to be due to

excessive accumulation of N in the plant, as the C/N ratio of the leaves also increased in proportion to the rise in temperature. The influence of fertilizers on resistance is stronger at lower temperatures.

[1894] 633.19-1.557: 551.577
ARAKERI, H. R. **The influence of rainfall during the different growth phases on the yield of Bajri in Poona for fourteen years.** *Indian Ecol.* 2, 1947, pp. 6. [Met. Office, Poona]

Rainfall during the pre-sowing period does not affect yield but affects the date of sowing. For good vegetative growth the rainfall should be 3-9 inches; 6 inches well distributed over the whole growing period gives good yields of both grain and fodder. Heavy rainfall during flowering or ripening gives low yield of grain and is likely to cause lodging.

633.2/3 GRASSES. LEGUMES

(See also Abs. Nos. 2012, 2020)

[1895] 633.2.03-1.81: 581.192
SEATH, D. M.; RUSOFF, L. L. **High-mineral herbage in fertilized pasture.** *La. Agric. Expt. Sta. Dairy Res. Digest* 3, No. 2, 1945 (2). *E.S.R.* 93, 1945 (475-476). C.A. 42 (5599).

Analysis of the herbage showed that the Ca, P and protein contents were greatly increased in fertilized pasture. As the growing season advanced, the protein and Ca content of the dry matter declined. Manuring increased the dry-matter yield and the protein and Ca contents of White Dutch clover.

[1896] 633.2.03-1.81: 581.192: 619
WEBB, R. J.; LEWIS, J. M.; KAMMLADE, W. G., ET AL. **The level of soil fertility and its relation to plant and animal production.** *J. Animal Sci.* 7, 1948 (159-169). C.A. 42 (6481). [Ill. Agric. Expt. Sta., Urbana]

Applications of limestone and phosphate resulted in changes in the botanical composition and yields of forage, but did not produce a significant change in the chemical composition of plants. No significant changes in composition were observed in bone ash or serum phosphate of sheep or lambs. There was no difference in the reproductive performance of the experimental animals.

[1897] 633.2.03-1.879.2
MALOCH, M. **Vplyv stokových vôd na výnos a kvalitu trávneho porastu. [The influence of sewage water on the yield and quality of grassland.]** *Sborn. České Akad. Zeměd.* 19, 1946 (57-109). Herb. Abs. 18 (187). [Cz.e.r.]

After removal of fatty and soapy matter, sewage water at Košice, Slovakia, was used for the irrigation of grassland. The water contained 149 kg./ha. of N, 29 kg. of P_2O_5 , 15 kg. of K_2O and 90 kg. of CaO. The yield of green matter was increased by 133% in 3 years. The beneficial influence of irrigation persists in the second and third years after irrigation is stopped because 50% of the N present in the sewage water is in the form of NH_3 which acts slowly. The proportion of grasses to clover was kept well in balance. Grazing was possible until late autumn and the importance of sewage-water irrigation was particularly outstanding during the drought of 1939.

[1898] 633.2.03-2.51-1.44
CHAMPNESS, S. S.; MORRIS, K. **The population of buried viable seeds in relation to contrasting pasture and soil types.** *J. Ecol.* 36, 1948 (149-173). [Grassland Improvement Sta., Stratford-on-Avon]

Samples were taken at depths of 0-2 inches and 2-6.5 inches from selected fields chosen to represent a wide range of grassland types; some had been ploughed for wartime cropping. After drying, sub-samples were allowed to germinate. The potential weed population was small in the best ryegrass pastures and higher in poorer ryegrass, *Agrostis* and *Agrostis-fescue* fields. Arable populations were lower than their grassland counterparts, suggesting that cultivation reduces the weed-seed population. This may be due to more adequate liming, better drainage and the raising of deeply buried seeds to the surface. Calcareous soils did not contain a significantly higher proportion of viable legume seeds than non-calcareous soils, although a wide variety of legumes is characteristic of calcicolous communities. The population: species ratio was high on heather moors and low on downland and may be correlated with the poor survival of seeds in soils of high pH and low moisture content.

[1899] 633.2.03-2.7-2.951
CARNE, P. B. Experiments in the use of DDT against the pasture cockchafer, *Aphodius howitti* Hope. *Aust. J. Coun. Sci. Indust. Res.* 21, 1948 (1-6). [Div. Econ. Ent., Canberra]

2% DDT applied as a dust in talc at the rate of 166 lb./acre gave poor control at 2 months and almost complete control at 11 months after treatment. The evidence is that DDT persisted in the soil for at least 6 months and killed first instar larvae of the generation following that present at the time of treatment.

[1900] 633.21-1.84-2.951
AMERICAN FERTILIZER. Fertilizer plus DDT increase bluegrass yields. *Amer. Fert.* 108, No. 13, 1948 (26).

Topdressing bluegrass with 60 lb./acre of N in early March increased seed yield by 187 lb./acre. Application of 30 lb./acre of DDT dust, containing 5% DDT, increased yield by 135 lb./acre. Continued application of N and insecticide increased yield by 448 lb./acre.

[1901] 633.3-1.453 : 546.621
DIAKOVA, E. V. Effect of acidity of podzol soils and of mobile aluminium on development of clover and lucerne. *Pochwovedenie* 1948 (177-183). *Herb. Abs.* 18 (188). [R.]

Failure of clover and lucerne sowings on acid soils is due partly to high exchangeable acidity caused by increased content of mobile Al, which is accompanied by insufficient assimilation of P. Crops develop normally with 2 mg. of mobile Al per 100 gm. of soil. With 3-4 mg. of Al the plant begins to fail and failure is complete with 10-12 mg.

[1902] 633.3-1.821.2
KEVORKOV, A. P. [Gypsum as a source of sulphur in plant nutrition.] *Dokl. Akad. S.-Kh. Nauk* 13, No. 2, 1948 (17-22). *C.A.* 42 (6481). [R.]

Gypsum is effective in increasing yields of clover and lucerne, primarily by serving as a source of S for the plants. An indirect effect of gypsum is the supply of available K.

633.491 POTATOES

(See also Abs. No. 2018)

[1903] 633.491-2.3-1.43
DAVIDSON, R. S. Factors affecting the development of bacterial soft rot of potato tuber initials. *Phytopath.* 38, 1948 (673-687). [Minn. Agric. Expt. Sta. and R.I. Agric. Expt. Sta.]

Potato yields are low in poorly drained areas when excessive rainfall prevails for several days during the period of tuber initial formation, owing to lenticel infection with several species of bacteria. The relative prevalence of soft-rot bacteria may vary in different soils. Tuber initials grown in wet soils where high N fertilizers had been applied were very susceptible to lenticel infection. The development of infection is retarded by soil temperatures of 18°C. and lower, and is accelerated by higher temperatures. The soil conditions in which lenticel infection occurs are also optimum for the growth of bacteria which are more active under partially anaerobic conditions. The anaerobic atmosphere of the rhizosphere is not conducive to the growth of fungi and prevents development of Actinomycetes. This unnatural balance in the soil microflora may reduce the prevalence of micro-organisms antibiotic to the soft-rot bacteria. The increased bacterial activity may also be due to a symbiotic relation of soft-rot bacteria and other bacteria that would not be present in soils of lower moisture content.

[1904] 633.491-2.7-2.951
BEGUE, H. Nouvelles études sur les produits antidorophoriques. [New studies on products for control of potato beetle.] *Ann. Épiphyties et Phytogénétique* 12, 1946 (209-244). *Biol. Abs.* 22 (1473). [F.] [Cent. Nat. Rech. Agron., Versailles]

Tests carried out in the open field on larvae of potato beetle showed the remarkable insecticidal power of : (1) hexachlorocyclohexane (active at a dose of 1 kg./ha.); (2) a sulphur derivative of this substance obtained by the reaction of alkaline sulphur (500, 750 gm./ha.); (3) dinitrocyclohexylphenol (active at 300 gm./ha.); (4) DDT (900 gm./ha.). Thiodiphenylamine also gives good results when applied at the rate of 7.5 kg./ha. or when mixed with carbazol (3.6 kg. of each per ha.). Cu arsenate, basic Cu arsenio-sulphate, nascent Cu arsenate and

Cu arsenite are active at doses of 1 kg. to 1.5 kg./ha. A mixture composed of As_2O_3 , $Al_2(SO_4)_3$ and $Ca(OH)_2$ is active at the dose of only 300-500 gm./ha. of As. Against adult potato beetles, the only active products are powders of thiodiphenylamine at 60% or mixtures containing 25% thiodiphenylamine and 25% carbazol as well as DDT or dinitrobenzylphenol preparations. Nicotinized powders, HCN, alkaline carbonates and pyrethrum powders have no noteworthy efficacy and their use should be forbidden.

633-5 FIBRE PLANTS

(See also Abs. No. 1968)

[1905] 633-51-1.811.4:581.144.2
PRESLEY, J. T.; LEONARD, O. A. **The effect of calcium and other ions on the early development of the radicle of cotton seedlings.** *Phytopath.* 38, 1948 (571).

Adequate moisture during the germination period and adequate Ca during the early stages of growth are necessary for producing cotton seedlings with healthy radicles.

[1906] 633-51-2.4-1.67
STATEN, G.; COLE, J. F., JR. **The effect of pre-planting irrigation on pathogenicity of *Rhizoctonia solani* in seedling cotton.** *Phytopath.* 38, 1948 (661-664). [N. Mex. Agric. Expt. Sta.]

Severe infestations of *Rhizoctonia solani* occurred in irrigated cotton areas when seed of susceptible crops was planted in dry soils after crops of lucerne and sugar beet grown for seed. The dry infected plant refuse produced severe damping-off in cotton seedlings. *Rhizoctonia* can be partially controlled by giving the seedbed a pre-planting irrigation which allows an incubation period of several weeks during which the pathogen is partially inhibited by antagonistic or competitive organisms in the soil. In rainfall areas seedbeds should be prepared early when the soil is moist.

[1907] 633-584.5-1.5
WHITE, D. G. **Bamboo culture and utilization in Puerto Rico.** *P.R. Fed. Expt. Sta. Circ.* 29, 1948, pp. 34. [Subtrop. Fruit Field Sta., Orlando, Fla.]

Clump bamboos are described. They spread less rapidly than the running type,

and their restriction is not a problem. They need at least 40 inches of well distributed rain, grow in almost any soil which is not very acid or very alkaline and have extensive roots useful in erosion control on soft river banks and on hillsides of gradient 50° or more, where few other economic crops can be grown. Some species withstand temperatures of 17°F.

Propagation is commonly by division: each culm is cut above the second node from the base and the stump and underground part severed by axe from the parent clump. In the layering method a live culm with some of its underground part attached is buried in a furrow after the primary branches have been pruned to a length of 1-3 feet. A few secondary branches are left with leaves intact. New plants grow from the nodes. After 6-8 months the internodes are gently excavated and sawn through, and 3 months later the young plants are transplanted. 2- to 4-foot cuttings of green culms of some species will strike root, but rooting is less uncertain with branch cuttings about a foot long, which must include the enlarged base of the branch. Synthetic root-promoting substances are of little effect, and species vary as to the time of year at which cuttings should be made. Growth from seed is economical and convenient, but flowering, which occurs at intervals of 20-80 years, cannot yet be artificially induced. Seed viability deteriorates after 3-4 months without special storage. Seed stored over $CaCl_2$ at room temperature gave 84% germination after 6 months.

Planting at a dry season is useless without irrigation. The land should be cleared of weeds and brush but not cultivated, and divisions or other material should be planted at the corners of equilateral triangles of side 12-15 feet depending on species, if the soil is poor or climate unfavourable, or of side 20-25 feet in good soil or climate. The holes should be 1 foot deep and wide with 2 inches of rotted manure or compost lightly covered with soil. Soil should be firmly tamped around the division to the height at which it previously grew and should be mounded 2-3 inches above the surrounding level. Water is needed within a few days, and 3-5 gallons in very dry weather. A mulch 1 foot deep, applied just before the rains end, conserves water. Weeds are

mown when a foot high. A few seeds of tropical kudzu will gradually smother weeds, but the vines must not climb the bamboo stems in the first few years. Fertilizing (3 lb. of 12-10-6 per plant after 1 and 2 years) may be repayed on poor soil: experimental fertilizing of a few clumps of each new planting should indicate this.

633.6 SUGAR CROPS

[1908] 633.61-1.81
VALLANCE, L. G. **Results of a two-cycle fertilizer trial. The interaction of nitrogen and potash.** *Cane Grow. Quart. Bull.* 12, 1948 (29-31). [Bur. Sug. Expt. Sta., Brisbane]

Applications of N, P and K in all possible combinations were made on two crop cycles each of which consisted of a plant, a first ratoon and a second ratoon crop. The P and K were placed in a drill at planting and at ratooning and the N was applied some weeks later as a top dressing. The soil was red volcanic soil rich in P and there was no response to super. The response to N and K was marked, but although the soil was deficient in K there was no increase in yield from the application of K without N. These soils have a reputation of showing little response to $(\text{NH}_4)_2\text{SO}_4$; this may be due to insufficient K in the soil.

[1909] 633.61-2.7-2.953
MUNGOMERY, R. W. **The use of "gammexane" in controlling "white grubs" in Queensland canefields.** *Cane Grow. Quart. Bull.* 12, 1948 (21-28). [Bur. Sug. Expt. Sta., Brisbane]

Benzene hexachloride used as a drill dressing at 100 lb. of 10% dust per acre 1-2 months before beetle flight gave adequate protection against grubs of the grey-back cane beetle (*Dermolepida albohirtum* Waterh.) in both larval and adult form. It had no apparent toxic effect on sugarcane and remains toxic in the soil for at least 7 months.

[1910] 633.61-2.954
HANCE, F. E. **Weed control in Hawaiian sugarcane lands—contact herbicides.** *Hawaii. Plant. Rec.* 52, 1948 (93-112).

A description of the development of the use of CADE (Concentrated Activated Diesel Emulsion) as a herbicide.

[1911] 633.61-2.954
HANSON, N. S. **Weed control experiments and practices in sugar-cane production.** *Hawaii. Plant. Rec.* 52, 1948 (113-154). [Univ. Neb.]

A report on a study of Hawaiian conditions and problems, containing information on present weed-control practices, chemicals which are being used experimentally and the results obtained. Types of application equipment in use under the various conditions and the entire weed-control programme and its effectiveness in each plantation are also discussed.

[1912] 633.63 : 551.58
SWIFT, E. L.; CLELAND, F. A. **The effect of climate on sugar beet yields in Western Montana.** *Proc. Amer. Soc. Sug. Beet Tech.* 1946, 1947 (135-140). *Biol. Abs.* 22 (1450).

The average of October through September daily mean temperature readings in Western Montana are closely related to beet yields, with each degree of annual variation producing approximately 1 ton difference in beet yields. Sucrose percentages are generally lower where the annual mean temperature is high. Annual precipitation is also associated with yields but not to the same extent as mean temperature. By use of the average daily mean temperature from October through June 1945, it was possible in early July to estimate the yield within 0.5 ton and in early October 1945, within 0.25 ton. Use of N fertilizer is beneficial in increasing yields, particularly in seasons of low mean temperature when nitrifying bacteria are inactive.

[1913] 633.63-1.3
BREWBAKER, H. E.; WOOD, R. R.; BUSH, H. L. **Agronomic studies relating to mechanization of sugar beet culture.** *Proc. Amer. Soc. Sug. Beet Tech.* 1946, 1947 (121-128). *Biol. Abs.* 22 (1448). [Gt. West. Sug. Co., Longmont, Calif.]

With ample soil moisture, better emergence was obtained with flat planting as compared with furrow and ridge-cover. A high degree of weed control was associated with ridge-cover. Regardless of spacing in the row all treatments with row widths in excess of 20-22 inches resulted in depressed yields.

[1914] 633.63-1.3
 ROWAN, J. E. **Mechanization of the sugar beet industry of Scottsbluff County, Nebraska.** *Econ. Geog.* 24, 1948 (174-180).

The soils of this county, in which sugar beet is the main crop, are mostly loams with some clay loams. The surface gently undulates and the variable rainfall averages only 14 inches per year. In the interests of irrigation much of the land has been levelled yearly by the rectangular "float" with a controllable levelling crossbar near its centre, in some cases covering a width of 14 feet. This levelling by floats and by sediments from the irrigation process has enabled the use of 6-row planters, except in small oddly shaped fields, and of 6-row cultivators and cross blockers, the time saved being 40% in planting and cultivating and 20% in thinning. 2-row lifters raise the beet about 3 inches and halve the lifting time. In 1945, 35% of the crop was mechanically loaded, saving 60% of the loading time. To obviate the labour of shovelling openings in irrigation laterals and leading the water to individual rows, wooden or steel pipes are placed in the banks in early June and left all summer, or plastic syphon pipes are fitted for each watering, flow being controlled by a canvas mat in the lateral. Manure loaders, fitting in front of most types of tractor, are widely successful provided the feeding lot, where loading is done, is firm enough to bear the tractor.

[1915] 633.63-1.35
 POWERS, J. B. **The development of a new sugar beet harvester.** *Agric. Engng.* 29, 1948 (347-351, 354). [Univ. Calif. Agric. Expt. Sta.]

A discussion, under the headings topping, ploughing, root elevation and root disposal, of the problems and results of 10 years' work on an attempt to develop a mechanical beet harvester as part of the University of California—U.S.D.A. project to investigate the possible field of mechanization in beet growing. The harvester described needs mechanical refinement, particularly in the lifting mechanism which, however, is the only device which has so far appeared that shows promise of harvesting topped beets under all soil-moisture conditions.

[1916] 633.63-1.427.3
 ULRICH, A. **Plant analysis as a guide to the fertilization of sugar beets.** *Proc. Amer. Soc. Sug. Beet Tech.* 1946, 1947 (88-95). *Biol. Abs.* 22 (1450).

Plant-nutrient surveys of sugar-beet fields were made by analysing petioles of sugar-beet leaves collected during 1943 and 1944. On the basis of the critical nutrient levels, 87% of the 70 fields were low enough in N to warrant its use in field fertilizer experiments. Similarly, 43% of the fields were low in P and 14% were low in K. Addition of N to soils where the sugar beets were already high in N as shown by petiole analyses failed to produce a visible effect on the growth of the beets. Petiole analyses indicated that the beets in this field were deficient in P. In fields where petiole analyses showed the beets to be low in N, the N values in each case being below the critical level for N, the addition of N increased the yields by 1.5, 8.4 and 4.6 tons/acre.

[1917] 633.63-1.531
 PENDLETON, R. A. **Sugar beet seed growing in the Pacific Northwest.** *Proc. Amer. Soc. Sug. Beet Tech.* 1946, 1947 (278-280). *Biol. Abs.* 22 (1450).

Most of the soils of these areas are deficient in N, S, B and organic matter. While supplemental irrigation is helpful, crops can be produced without it, and high yields of good quality seed have been grown where proper cultural practices have been used.

[1918] 633.63-2.8-1.81
 HULL, R.; WATSON, M. **Factors affecting the loss of yield of sugar beet caused by beet yellow virus. II. Nutrition and variety.** *J. Agric. Sci.* 37, 1947 (301-310). [Midland Agric. Coll., Sutton Bonington, and Rothamsted]

Manurial treatments generally increased the root and sugar yields of both infected and healthy plants, but the losses caused by infection increased proportionately. When the effects of N, farmyard manure and salt on mean yield were large, the losses caused by infection were increased more than proportionately. Fertilizers had little effect in varying the symptoms of the disease. There was some indication that the red colour associated with some varieties was intensified by deficiency of P and K. The

rate at which infection spread was occasionally increased by N, P and K and was little affected by salt.

633.7 STIMULANTS (See also Abs. Nos. 1971, 2008)

[1919] 633.71-2.2
JENKINS, W. A. **Root-rot disease-complexes of tobacco in Virginia. I. Brown root rot.** *Phytopath.* 38, 1948 (528-541). [Tobacco Res. Lab. Agric. Expt. Sta., Chatham, Va.]

Brown root-rot is initiated by the feeding habits of meadow nematodes of which *Pratylenchus pratensis* produces severe symptoms. Supplementary N applications, rotations with different tobacco varieties and hilling of the soil high around the bases of the plants afford temporary benefit to the current crop. Soil fumigation in conjunction with the development of tobacco varieties which will produce vigorous root generation may offer more permanent control.

[1920] 633.71-2.2-2.953
KINCAID, R. R. **Soil fumigation for cigar-wrapper tobacco in Florida.** *Phytopath.* 38, 1948 (570).

Applications of 20 gallons/acre of dichloropropene-dichloropropane mixture and 30 gallons/acre of ethylene dibromide (10% by weight) in January, nearly 3 months before transplanting, substantially reduced root rot and nematode root rot, increased yield by 200-400 lb./acre and made no important difference to grade and fire-holding capacity of the leaves.

[1921] 633.71-2.2-2.954.6
THOMPSON, J. W. **Cyanamide for control of eelworm.** *Trelawney Tobacco Res. Sta. Rept.* 1947, 1948 (43).

Soil treatment with 1000 lb./acre of cyanamide had no effect on the stand of tobacco or on eelworm infestation. P and K were added to the treated plots, but the tobacco was coarse and rank owing to the large amount of N supplied in the cyanamide.

[1922] 633.71-2.7-2.951
MOFFETT, A. A. **Soil insect pests. Gammexane trials and D.D.T. tests.** *Trelawney Tobacco Res. Sta. Rept.* 1947, 1948 (30-37).

Gammexane gives a high degree of protection against both white grubs and wireworms in tobacco land. Tobacco plants require protection for 5 weeks after planting. In experiments, concentrations of gammexane lower than 0.25% were not efficient against wireworms but concentrations of 0.04% controlled white grubs. Gammexane quickly renders grubs and wireworms incapable of attacking the crop, but killing action seems to be delayed. If applied near planting time it should control damage, and it is suggested that it should be mixed with the fertilizer, thus reducing field operations. Gammexane had no effect on crickets.

DDT is very slow in its effect on wireworms but had some effect in controlling white grubs; it is not as effective as Gammexane. Broadcast applications of 50 and 100 lb./acre of 5% powder are too low. 150 lb./acre was fairly effective, but larger dressings and different methods of application are suggested. 100-150 lb./acre reduced damage due to crickets.

Neither Gammexane nor DDT had any effect on the quality of the tobacco.

[1923] 633.74-2.8-1.4
WEST AFRICAN CACAO RESEARCH INSTITUTE. **Soil and virus disease of cacao.** *W. Africa Cacao Res. Inst., Tafo, Rept.* 1945-46, 1947 (39-40).

Swollen shoot has been recorded on trees growing on almost all soils on which cacao is grown in West Africa and there is no evidence that different strains of the virus are influenced by the type of soil.

633.8 AROMATIC AND OIL PLANTS

[1924] 633.854.56-2.191-1.811.3
NEARPASS, D. C.; DROSDOFF, M.; BROWN, R. T. **Effect of fertilizing tung trees with potash and other materials on the exchangeable cation content of Red Bay fine sandy loam.** *J. Amer. Soc. Agron.* 40, 1948 (771-777). [Bur. Pl. Indust., U.S.D.A.]

On the red and yellow podzolic soils of the South-East, intravenous chlorosis of tung leaves is frequent and is associated with low K content of the leaf. Basal fertilization of trees with 4-5 lb. per tree of 4-10-7 failed to maintain the original low K level (0.07-0.17 m.e./100 gm. in the 0-6-inch layer). Addition

of K_2O at 2.94 and 5.88 lb. per tree, whether as muriate or sulphate, over a 4-year period significantly increased exchangeable K to depths of 12 and 18 inches respectively. *Crotalaria* mulch at 150-200 lb. green weight per tree increased the K in the 6-18-inch depths, but not in the surface layer. Increased N fertilization decreased the K content of the tung leaves. The K content increased significantly with the quantity of K applied and with the quantity of exchangeable K remaining in the soil at all depths to 18 inches.

[1925] 633.855-34-1.4
ERHART, H. La vocation des sols tropicaux pour la culture des plantes oléagineuses. [The suitability of tropical soils for oil plants.] *Oléagineux* 3, 1948 (1-12). Hort. Abs. 18 (145). [F.]

For the profitable cultivation of the oil palm, only the best soils, comparable to volcanic soils of the Netherlands East Indies, should be used. The fact that the oil palm survives in Africa on a wide range of soil types does not justify regarding them all as oil-palm soils.

[1926] 633.855-34-1.557:551-577
DEVUYST, A. Influence des pluies sur les rendements du palmier à huile. [The effect of rainfall on oil-palm yields.] *Oléagineux* 3, 1948 (137-144). Hort. Abs. 18 (145). [F.] [La Mé, Ivory Coast]

At La Mé, rainfall ceases to limit yields when it exceeds 300 mm. per month; the "useful" rainfall is obtained by recording only 300 mm. for any month in which this amount is exceeded. The number of bunches harvested annually depends on the "useful" rainfall for the 12-month period starting 33 months before, in which the flower buds were being formed. The annual mean bunch weight depends on the useful rainfall from the 33rd to the 6th month before the harvest period. Oil-palm yields can be predicted nearly 2 years in advance, as bunch number is more important than bunch weight.

[1927] 633.88-1.4:581.192
HECHT, W. [Recent work on the influence of climate and soil on the content [of active substances] in medicinal plants.] *Scientia Pharm.* 15, 1947 (51-55); 16, 1948 (13-17). C.A. 42 (5959).

Review on the variation with altitude and soil of the composition of a number of types of plants. Contrary to popular opinion, high altitudes often result in lowered assay.

[1928] 633.885-1-1.432.2:581.192
LOUSTALOT, A. J.; WINTERS, H. F.; CHILDERS, N. F. Influence of high, medium and low soil moisture on growth and alkaloid content of *Cinchona ledgeriana*. *Plant Physiol.* 22, 1947 (613-619). Hort. Abs. 18 (145).

Seedlings were grown in chambers in which temperature and relative humidity were controlled. Seedlings grown with (1) low soil moisture (9-13%) for 6 months (wilting point = 9.5%) were smallest and their roots contained less quinine sulphate and total alkaloid than those grown with (2) medium (20%) and (3) high (30% to saturation) moisture contents. Leaves of seedlings receiving treatment (3) developed necrotic spots between the veins and many became yellow and fell. These symptoms resemble those of Mn deficiency or toxicity observed in field plantings.

[1929] 633.887-791-1.5
PYRETHRUM BOARD OF KENYA. The cultivation of pyrethrum in Kenya. *Pyrethrum Bd. Kenya Pub.* 1947, pp. 15. Hort. Abs. 18 (107).

633.9 RUBBER PLANTS

[1930] 633.913-32-1.811.2
MIKHAILOV, N. N. [Effect of phosphate feeding conditions, in the early phases, on the production of kok-saghyz rubber.] *C.R. Acad. Sci. (U.S.S.R.)* 59, 1948 (367-370). C.A. 42 (6419).

Seeds were planted in soil containing 4 gm./sq.m. of P_2O_5 and transplants were made after 30 days into soil with and without super. Flowering was greatest (70%) and rubber content was increased 47-53% over controls in plants receiving abundant supplies of P during growth. During the first month of growth protein N was 50% higher in plants receiving high P than in controls; later it dropped gradually below the controls, and plants with abundant P matured and aged more rapidly than did the controls.

634 ORCHARDS. FRUIT

[1931] 634-I.416
WILCOX, J. C. **Soil sampling technique in orchards.** *Sci. Agric.* 28, 1948 (321-332). [Expt. Sta., Summerland, B.C.]

Samples were taken at depths of 0-8, 8-24 and 24-60 inches. Contents of available P and K usually decreased with depth, but Ca, free lime and pH usually increased with depth. These trends were not consistent, and the nutrient status of the surface soil was not a reliable guide to the status of the subsoil. No consistent seasonal trends in pH or in contents of available P, K or Ca were found. Variations in composition at different distances from the tree should be taken into account in sampling. Where P, K or Ca had been applied under the branches, the P, K and Ca content of the soil decreased away from the trunk. The same held true where P and K had not been applied, but where Ca had not been applied the soil content of Ca increased away from the trunk. pH increased away from the trunk and the electrical conductivity decreased.

[1932] 634-I.513
DERMINE, E. Les explosifs au service de l'arboriculture. [The use of explosives in the orchard.] *Fruit Belge* 16, 1948 (3-7). Hort. Abs. 18 (93). [F.]

The use of explosives is discussed in relation to the removal of tree stumps, the preparation of holes in which to plant trees and the fertilizing of the soil, part of the explosive charge being fertilizer material. The merits of this method of manuring are compared with those of manuring by fertilizer lance.

[1933] 634-I.67
MUIJZENBERG, E. W. B. VAN DEN. De watervoorziening in de boomgaard. [Providing water in the orchard.] *Fruittceelt* 37, 1947 (416-417). Hort. Abs. 18 (93). [Du.]

Methods for supplying fruit trees with water during dry weather are described and illustrated under the headings (1) underground watering, (2) surface irrigation and (3) spraying by large rotary sprayers (rain guns), small sprayers and oscillating pipes with holes.

[1934] 634-II-I.544-7:581.192
WANDER, I. W. **The effect of cultural and fertilizer treatments on the potassium content of soil, leaves, and fruit of apple trees, including a study of new methods of potassium analysis.** *Abs. of Doctoral Dissert. Ohio St. Univ.* 50, 1946, pp. 9. Hort. Abs. 18 (92). [Ohio Agric. Expt. Sta.]

The K content of apple leaves and fruit is related to available K in the soil. Soil mulching reduced the fixation of applied K and continuous straw mulching produced large amounts of exchangeable K without the addition of K fertilizers.

[1935] 634-II-I.81:581.192
CAWTHRON INSTITUTE. **Chemical composition of apple material under different fertilizer programmes.** *Cawthron Inst. Rept.* 1947-48, 1948 (15-16).

Leaves and apples from plots with the following treatments were analysed: (1) untreated, (2) P + N, (3) K + N, (4) P + K, (5) N + P + K. In the leaves, the K content for the 3 treatments which included K was 1.13% K_2O on dry matter and 0.50% for treatment (1); the lowest K content, of 0.42%, was in treatment (2). The highest P content of 0.34% P_2O_5 was obtained with (4) and the lowest was 0.20% with (3). N content was lowest (1.45%) with (4) and highest (1.88%) with (5). Mg was highest with (2) and (1) and lowest with treatments containing K.

Analyses of fruit did not show such marked differences as those of leaves, although the trends for K and N content confirm the results obtained with leaves.

[1936] 634-II-I.84-I.874
ANTHONY, R. D.; CLARKE, W. S., JR.; FAGAN, F. N., ET AL. **Response of Stayman apple trees in metal cylinders to varying amounts of inorganic nitrogenous fertilizers and green manures.** *Penn. Agric. Expt. Sta. Bull.* 483, 1947, pp. 120. Biol. Abs. 22 (950).

During the first six years of the experiment, from 1928 to 1934, the addition of inorganic N fertilizers without green manure gave a decrease of the residual soil-organic matter, due to stimulated microbial activity. Addition of green manure alone, even in amounts up to 25,000 lb./acre of organic matter by 1934, did not increase the organic-matter content of the soils. A marked increase in

organic C and N in the period 1934-38 was caused by accumulation of apple-tree roots. C increased more rapidly than N. Addition of green manure increased the amount of available P and K, but addition of N decreased the available P and K recovered from the soils.

[1937] 634.11-2-1.433.2
COOLEY, J. S. Collar injury of apple trees associated with waterlogged soil. *Phytopath.* 38, 1948 (736-739). [Pl. Indust. Sta., Beltsville, Md.]

Collar injury on apple trees is usually attributed to winter injury or to a pathogen such as *Phytophthora*. 5-year-old apple trees growing in heavy soil during a wet summer developed collar injury during the summer months, apparently as a result of waterlogged soil. When tree roots were inoculated with *Phytophthora cactorum* after removing soil from the collar, small lesions which did not develop further appeared on some trees.

[1938] 634.23-2.112-1.435
MANARESI, A.; MALUCELLI, R. A proposito della così detta "Moria" del ciliegio nel Cesenate. [The so-called "Moria" of cherries in the neighbourhood of Cesena.] *Riv. Frutticoltura* 9, 1947 (4-22). Hort. Abs. 18 (98). [I.e.]

Many trees in recent years, especially after very dry seasons, have declined and subsequently ceased bearing and died. The lime content of the soils and subsoils varies from 6 to 13.5%. Where the trees continue to flourish, the clay and sand contents vary from about 20 to 60% and 37 to 80% respectively in both soils and subsoils, but where a decline has set in the figures are approximately 82 to 95% for clay and 5 to 18% for sand.

634.3 CITRUS

[1939] 634.3-1.67
BENTON, R. J. Irrigation of citrus trees. *Agric. Gaz. N.S.W.* 59, 1948 (30-31). Hort. Abs. 18 (133).

Before irrigating, numerous soil-auger tests should be made to determine whether the soil is moist at a depth of a few feet. If a wet soil exists continuously at a certain average depth, light irrigations which cannot reach

that depth should be given, but not until it becomes apparent, early in the morning, that the foliage is approaching a wilting stage.

[1940] 634.3-1.67
HALLIDAY, O. E.; SPURLING, M. B. Sprinkler irrigation of an old citrus block on Murray sand. *J. Dept. Agric. S. Aust.* 51, 1948 (594).

A sprinkler-irrigation system was installed in Berri Experimental Orchard in 1946 and irrigations were applied at 4-weekly periods for 1-1½ hours. The infiltration capacity of the soil is approximately 4.2 inches/hour after 20 minutes' irrigation, decreasing to 3.6 inches after 1 hour. Considerable runoff occurred due to excessive precipitation at the drip fringe of the trees when irrigation was 300-500 gallons/hour or ¾-1½ inches/hour. Thorough cultivation and disc-banking before every spray irrigation were necessary to limit runoff, and breaks in the disc banks occurred during the irrigation, despite cultivation. For more than a year the trees grew well and a record crop of oranges was harvested in 1947. Early in 1948, trees began to wilt a fortnight after spray irrigation. The soil below 2 feet was found to be dry. Runoff during irrigation had prevented the heavier irrigations of the summer months from wetting the deeper root zone. The excessive cultivation used to increase the infiltration capacity of the soil is undesirable. The sprinkler-head output should be decreased until the application rate does not exceed the infiltration capacity of the soil, even at the drip fringe of the tree, and the surface soil should be improved by better cover cropping and improvement of the organic matter content of the top soil.

[1941] 634.3-2
RUGGIERI, G. Il mal secco, il marciume radicale e le malattie a processo gommoso. [Mal secco, root rot and gummosis.] Repr. *Citrus* 1946, pp. 15. Hort. Abs. 18 (135). [I.]

Of these diseases of citrus in Sicily, *mal secco*, caused by *Deuterophoma tracheiphila* Petri, is the most serious. It cannot be controlled by spraying, and the measures recommended are removal and destruction of infected branches and rootstocks, deep cultivation and manuring, preferably in summer, and the use of resistant varieties.

The root rot prevalent in Sicily is not due to a parasite, and occurs on wet clays with deficient subsoil aeration. Wide spacing, thinning of the branches, adequate drainage, thorough weeding carried out between irrigations which should themselves be light, and the application of manures in late winter and early spring (never in autumn) are recommended.

[1942] 634.3-2.112-1.58
BRUERE, G. M.; EVERETT, P. **Soil moisture in Kerikeri citrus orchards.** *N.Z. J. Agric.* 75, 1947 (487-488). Hort. Abs. 18 (133).

Trees aged 15 years showed the effects of dryness under any one system of orchard practice by defoliation and dropping of young fruits to a greater extent than 8- to 9-year-old trees, though the soil moisture was similar. On the dates when the topsoils reached their wilting points the young orchards under permanent cover crops showed greater defoliation than those which were cultivated. In these young orchards, however, the topsoils under permanent cover reached their wilting points later than the cultivated topsoils.

[1943] 634.3-2.19-1.811.3
CHAPMAN, H. D.; BROWN, S. M.; RAYNER, D. S. **Effects of potash deficiency and excess on orange trees.** *Hilgardia* 17, 1947 (619-650). Hort. Abs. 18 (133).

Orange trees can apparently secure ample K from a very low maintained supply. With K concentrations of 2-3 p.p.m. no signs of deficiency developed. At 117 p.p.m. no ill effects were seen, but with a concentration of 390 p.p.m. the trees were injured. Leaves of comparable age reflected the K status of the medium very well. The range between acute K deficiency and excess was from about 0.10% to 3.8% K on a dry-matter basis.

[1944] 634.3-2.191-1.811.6
HAAS, A. R. C. **Magnesium deficiency and its effect on citrus.** *Calif. Citrog.* 33 1948 (134, 146-150). Hort. Abs. 18 (133).

A popular article in which the symptoms are described and treatments are suggested for trial in orchards in which leaves show Mg-deficiency symptoms. Healthy, mature leaves from Californian orchards usually contain 0.3% or more of Mg on a dry-weight basis.

[1945] 634.31-1.4
HERRERO DE EGAÑA, M.; PENASCO CAMACHO, T. M. Los suelos del naranjo en el termino de Alcira. [**Orange-plantation soils in the Alcira district.**] *Bol. Inst. Investig. Agron. Madrid* No. 18, 1948 (141-180). [Sp.f.e.]

In this area of about 11,000 ha., oranges of lower quality are produced on the irrigated lower soils which are alluvial loams, while larger fruit, with finer peel and more juice and sugar content, are produced on the higher, sandy or very sandy soils, irrigated with water raised by pumping, that were often formerly regarded as sterile. This differentiation recalls that found in an earlier study (see Soils and Fertilizers 5 (44)) of the Carcagente district.

634.5/8 NUTS. PALM AND BUSH FRUITS. GRAPES

(See also Abs. Nos. 2007, 2026)

[1946] 634.55-1.81
CARRANTE, V. Un triennio di esperienze di concimazione al mandorlo. [**Three-year manurial trials with almonds.**] *Repr. Risveglio Agric.* Nos. 3-4, 1947, pp. 15. Hort. Abs. 18 (97). [I.]

The results of trials in Sicily and Apulia indicate that the effects of manuring almonds under dry-farming conditions are often masked by seasonal or genetic factors. Adult trees under the conditions of the experiment required 600 gm. of P_2O_5 , 400 gm. of K_2O and 200 gm. of N, preferably in the ammoniacal form. The fertilizer should be applied in autumn before the rains, and the omission of any one of these elements, especially K or P, results in reduced yield.

[1947] 634.571-1.5
MARLOTH, R. H. **The litchi in South Africa.** *S. Africa Dept. Agric. Bull.* 286, 1947, pp. 15. [Hort. Res. Sta., Nelspruit, E. Transvaal]

50 lb. of kraal manure should be applied in the planting hole some months before the tree is planted and annual applications of up to 500 lb. for large trees should be spread thereafter over the whole root area and disced lightly into the soil. The litchi is shallow rooted. Cover crops for turning under should be grown in summer. The

application of super. before the cover crop is sown increases the bulk of green matter. Unless the annual rainfall is 50 inches and well distributed throughout the year, irrigation is necessary.

[1948] 634.58-1.5
CLAY, G. F.; MONSON, W. B. L.; MCKENNA, D. **Report of West African Oilseeds Mission 1948**, pp. 57.

Best results in groundnut cultivation will probably be obtained from a minimum stirring of the top soil. Disc harrowing, whereby crop residues, weeds and grass roots are incorporated in the soil, will probably be the best form of cultivation, the crops being planted on the flat and slightly ridged at the final intercultivation. Closer spacing seems to lead to greater yields. Spacing of 2 feet between rows and 9 inches within rows gives a yield of 600 lb./acre of shelled nuts. This might be increased with fertilizers. The soils of Northern Nigeria, Gambia and the Voltaian Basin in the Gold Coast are deficient in P, and placement of P fertilizer at 25 lb./acre is recommended. This increases yields by 200 lb./acre in areas of low yield (up to 700 lb./acre). In Northern Nigeria N + P has increased yield. Incorporation of grass leys and strips in the arable rotation is necessary.

It is unlikely that a system of mixed farming can have any marked effect on the volume of produce within any reasonable period of time, because of difficulties of acquiring the necessary livestock. It is recommended that livestock should be introduced into Northern Nigeria but not primarily as draught animals and that power implements should be used for cultivation and fertilizer placement.

[1949] 634.58-2.732
MASSIBOT, J. A. Note sur l'importance des dégâts causés dans le nord du Sénégal aux gousses d'arachides en cours de développement par *Microtermes parvulus*. [Note on the importance of the damage caused in northern Senegal to the growing pods of groundnuts by *Microtermes parvulus*.] *Agron. Trop.* 1, 1946 (517-518). R.A.E. 36A (250).

Pods of groundnuts are damaged in Senegal during periods of drought in late winter by *Microcerotermes* (*Microtermes*) *parvulus*, Sjöst, which enters the growing pod

through a slit made near the free end and pierces the terminal seed which fails to develop. Termite damage is considerable even in normal years and may be serious in dry seasons. 10-30% by weight of pods have been attacked and the weight of damaged pods was only 67.9% of that of healthy ones.

[1950] 634.61: 633.2.03-1.582
SALGADO, M. L. M. **The possibilities of ley farming and alternate husbandry on coconut estates.** *Times, Ceylon*, July 19-24, 1947, p. 1. Hort. Abs. 18 (143). [Coconut Res. Scheme, Ceylon]

The assimilation by the coconut palm of the essential element, K, is upset by excess of N. It is proposed to reduce the rate of N mobilization by establishing a grass-legume ley to be disc-harrowed occasionally and ploughed in every 2 years when manures are applied. Regeneration is sufficiently rapid to allow of rotational grazing.

[1951] 634.774-1.4
TKATCHENKO, B. **Ecology of pineapples in Southern Indo-China. II.** *Inst. Fruits Agr. Colon.* 3, 1948 (4-12). B.A.BIII, 1948 (161).

Soil samples were examined for porosity, real and apparent specific gravity, resistance to crushing, shrinkage on drying and permeability which was assessed by measuring the time taken for water to penetrate a soil layer 20 cm. thick and the volume penetrating the same layer in one hour. Interpretation of the results correlated well with field observations on the suitability of different soils for pineapple production.

[1952] 634.8: 581.144.2: 577.17
MARTINEZ ZAPORTA, M. Seis años de experiencias sobre enraizamiento de portainjertos. [Six years of experiments on the rooting of cuttings.] *Bol. Inst. Investig. Agron. Madrid* No. 18, 1948 (1-140). [Sp.f.e.g.]

A first report is presented on a study of the effect under field conditions of root-promoting substances on cuttings of types of vine that do not easily produce rooting cuttings. Concentrations of 333 and 150 p.p.m. of α -indol-3-acetic and indol-3-butyric acids lessened the percentage of rooting cuttings obtained, but those that were obtained showed a much larger number of rootlets. With lower concentrations the

prejudicial effect was less noticeable. 90 and 30 p.p.m. of α -naphthylacetic acid or its K salt had no definite effect on the percentage. 1/200 mol. KMnO_4 increased the percentage for heavy soils but decreased it for sandy soils. The other substances—liquid manure, urea, yeast extract, azotobacter culture, etc., showed no definitely beneficial effect.

[1953] 634.8-1.5
QUÉNOT, N. La vigne dans les pays tropicaux : culture, taille, entretien. [The grapevine in the tropics : culture, pruning and maintenance.] *Agron. Trop.* 2, 1947 (647-650). Hort. Abs. 18 (144). [F.]

Includes brief recommendations for choice of soil, planting of cuttings, transplanting, irrigation and fertilizing under French-Sudan conditions.

634.9 FORESTRY

(See also Abs. No. 1975)

[1954] 634.9 : 551.578.4
WILM, H. G. The influence of forest cover on snow-melt. *Trans. Amer. Geophys. Un.* 29, 1948 (547-557).

Canopy interception and loss of snow by evaporation is greatest in dense conifer forest and least in hardwood stands or open land. The surface blanket of snow melts at a lower rate under the denser stands. The most desirable type of forest for snow conservation appears to be a fir forest with a maximum number of glades, an aspen or hardwood forest with clumps of conifers also being useful. Melting rates were greater on open land and were accelerated in forests by timber cutting.

[1955] 634.975-2.19-1.811.2
AUSTRALIA. COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH. Fertilizer experiments in pine plantations. *Aust. Counc. Sci. Indust. Res. Rept.* 1946-47, 1947 (18).

Treatment of *Pinus taeda* with $\frac{3}{4}$ cwt./acre of super. in 1941 and with $1\frac{1}{2}$ cwt./acre in 1939 increased growth rate and lessened "needle-fusion" symptoms, but the effect now seems to have stopped. Plots treated with 3 cwt./acre of super. in 1939 are also showing signs that fertilizer treatment should be repeated. Adjacent plots of *P. caribea* which

received $2\frac{1}{2}$ cwt./acre of ground rock phosphate or 2 cwt. of super. in 1939 are also showing signs of decreased growth rates, but there has been no reappearance of "needle-fusion".

635 HORTICULTURE

(See also Abs. Nos. 1715, 1852, 1857, 2013)

[1956] 635-1.586
BRAUN, E.; WALKOF, C. Hints on dry land gardening. *Canada Dept. Agric. Pub.* 619, 1947, pp. 8. Hort. Abs. 18 (109).

These recommendations for vegetable gardens are based on results obtained in drought areas during the "dry thirties" and cover operations from the preparation of the soil to the control of weeds, insects and diseases. Stress is laid on the need for trapping snow and conserving its spring run-off. Half the garden should be summer fallowed.

[1957] 635-1.86 : 577.16
EKMAN, B. Effect of manure on ascorbic acid concentration in certain vegetables. *Kgl. Fysiograf. Sällskap. Lund Förh.* 17, 1947 (114-121). C.A. 42 (5599). [E.]

Experiments were made to determine whether stable manure contains substances inhibiting the synthesis of ascorbic acid by lettuce, parsley, spinach, chives and white cabbage. Stable manure was used at the rate of 25 and 50 tons/ha. The artificial fertilizer supplied contained the same amount of N as 25 tons of manure and included KNO_3 , KCl (40% K_2O) and super. Neither stable manure or artificial fertilizer contained substances having a specific effect on the synthesis of ascorbic acid.

[1958] 635.34-1.84-1.816.2
CASTLE, R. B. Nitrogenous top dressing of spring cabbage. *Agriculture* 55, 1948 (265-266). [Univ. Reading]

A medium heavy loam manured with 12 tons/acre of straw compost followed by 4 cwt. of super. and 1 cwt. of muriate of potash was used for an experiment in 1947/8 to test the effect of NaNO_3 as autumn and spring dressings. 3 cwt./acre of NaNO_3 was applied in November and March. The autumn application produced a softer, more

succulent growth, easily damaged by frost, and the loss of plants in winter was greater than from the plots receiving no N; there was no effect on final yield. The spring application gave over 4 times the total yield of marketable greens given by the plots receiving no N.

[1959] 635.35-1.5
MINISTRY OF AGRICULTURE AND FISHERIES.
Winter (broccoli) and summer cauliflowers. *Min. Agric. Bull.* 131, 1948, pp.18.

Rotations, soils, cultivation and manuring of broccoli and cauliflowers in England are described with accounts of local practices in different parts of the country. Pests and diseases are discussed.

[1960] 635.52-2.8-2.953
ALLEN, M. W. **Relation of soil fumigation, nematodes, and inoculation technique to big vein disease of lettuce.** *Phytopath.* 38, 1948 (612-627). [Univ. Calif., Berkeley]

Transmission of big-vein virus to lettuce plants occurred only through the roots as a result of contact with soil containing the virus and in the absence of a vector or deliberate wounding of the roots; nematodes did not transmit the virus. The virus appears to be free in the soil or possibly absorbed on soil particles, and infection probably occurs through wounds caused by abrasion or by the breaking of small roots as a result of alternate wetting and drying of soil. Symptoms of big vein appear to develop more rapidly in plants transplanted into virus-infected soil than in seedlings grown from seed in infested soil. The virus probably persists in the soil of infested lettuce fields as the result of continued addition of new virus to the soil from disintegrating roots of infected plants. The virus can remain infective when freshly extracted root juice is diluted with at least 200,000 parts of water.

Lettuce big-vein virus is inactivated when virus-infected soil is fumigated with chloropicrin at 0.23 ml./gallon of soil or with dichloropropene-dichloropropane mixture at 0.46 ml./gallon of soil. Ethylene dibromide and benzene hexachloride did not inactivate the virus.

[1961] 635.611-2.111
BRASHER, E. P. **Successful method of utilizing glass protectors.** *Proc. Amer. Soc. Hort. Sci.* 49, 1947 (287-295). B.A.BIII, 1948 (163).

Glass protectors cause an increase in soil temperature (at 1-inch depth) and air temperature sometimes by as much as 8.3° and give protection against 2.2° of frost. Protectors with lower emissivity coefficients and higher reflectivity than those of ordinary glass were less effective than ordinary glass protectors in accelerating growth and harvest dates of cantaloupe melons.

[1962] 635.64-1.816.3
STARK, F. C. **Fertilize for greater tomato yields.** *Food Packer* 29, No. 1, 1948 (80, 82-83). C.A. 42 (6979).

The least effective method of application was to broadcast and disc in the fertilizer, while the most effective was in bands 10 inches apart and 4 inches deep. Application of up to 1000 lb. of complete fertilizer per acre was economically feasible when properly applied. With increased rate of application of fertilizer, the composition decreased in importance and the method of application became more important.

[1963] 635.656-2.4-1.582
SCHROEDER, W. T.; REINKING, O. A. **Effects of seven different vegetable canning crop rotations on the incidence of root-rot, quality, and yield of peas; and on the fertility level and structure of the soil.** *N.Y. St. Agric. Expt. Sta. Rept.* 1947, 1948 (31).

Root-rot infested soil can produce a good crop of peas when environmental conditions are favourable. Root rot was most severe in plots planted continuously to peas for 7 years and which had no fertilizer the previous year. A continuous pea plot that received fertilizer the previous year yielded almost as well as the legume and nonlegume rotations.

[1964] 635.9-2.2
WILSON, G. F. **The bulb and stem eelworm in relation to garden plants.** *J. Roy. Hort. Soc.* 73, 1948 (335-345).

Attack by the bulb and stem eelworm (*Anguillulina dipsaci* Kühn) can be largely avoided by a 3-year rotation and destruction of weeds which may be hosts of eelworm. All remnants from infected land should be removed and burnt. Effective drainage is necessary to avoid the eelworms spreading in surface drainage and in flood water.

Steam sterilization of glasshouse soils and composts, and warm-water sterilization of the living plant are recommended. Soil fumigants are not so effective as steam sterilization.

[1965] 635.965-1.415.1
MUSSEY, H. B. **Effects of soil acidity and available phosphorus on population changes in mixed Kentucky bluegrass-bent turf.** *J. Amer. Soc. Agron.* 40, 1948 (614-620). [Pa. Agric. Expt. Sta.]

Population changes were studied over a four-year period after raising or lowering the soil pH by addition of lime or S respectively and with varying amounts of available P. Uniform amounts of N and K were supplied. Differences in percentages of the species in the seed mixtures did not produce significant differences in the percentages of the grasses in the turf. Proportions of total turf contributed by *Poa pratensis* were highest under conditions of low acidity and high P but declined steadily through the four-year period. Strong competition by *Agrostis*, which tolerated a wider range of conditions, is the suggested reason for the failure of *Poa* to maintain itself in the mixed turf.

GEOGRAPHICAL

(4) EUROPE

(See also Abs. Nos. 1789, 1810, 1945)

[1966] (4)632.112 : 551.58
SEIFERT, A. **What means this drought?** *J. Ecol.* 36, 1948 (174-179). [Munich]

The drought of 1947 is discussed and shown to be part of a sequence which points to a general change of climate in Europe. It is advocated that water be controlled by re-stocking the countryside with hedgerows, tree lines and copses, preserving ponds, ceasing to straighten and "clean up" water courses, studying the whole complex of subsoil moisture and re-establishing the large forests.

[1967] (42)631.86/7 : 631.81
JENKS, J. E. F. **Soil fertility in Britain.** *J. Soil Water Conserv.* 3, 1948 (119-120, 150).

An outline is given of the work of the Soil Association and of experiments to be undertaken on the use of organic fertilizers and chemical fertilizers on the Association's farm at Haughley in Suffolk.

[1968] (42)633.584.5-1.5
RAMSAY, A. **Bamboo canes—an unusual British crop.** *Farmer and Stockbreeder* 61, 1947 (351). *Biol. Abs.* 22 (1441).

Under the auspices of the British Bamboo Cane Company 22 acres of bamboo canes are being grown near Bodmin, Cornwall. Six million canes were harvested in 1946. The leaves and branches of some kinds are composted and used for mulching strawberry plants, but the bulk of the trimmings is burned as a source of potash. Bamboos like leaf mould, super., K_2O and NH_4 but not lime.

[1969] (43)631.557 : 631.81
LEMMERMANN, O. **Bis zu welcher Höhe können und müssen die Erträge in Deutschland gesteigert werden? [To what extent can and must yields be raised in Germany?]** *Ztschr. Pflanz. Düng.* 37, 1946 (193-197). [G.]

Pre-war average yields of winter wheat were 21-22 dz./ha. and of potatoes 150-190 dz./ha. with an average plant-nutrient application in kg./ha. of approximately : N 21, P_2O_5 23 and K_2O 36. If yields at this level were attained again, Germany could supply about 50% of her food requirement instead of 80% as before the war. It appears a reasonable deduction from numerous fertilizer studies, and taking account only of the fertilizer aspect, that average yields of 25-30 dz./ha. of cereals and 250-260 dz./ha. of potatoes should be attainable with average applications of about 40, 60 and 80 kg./ha. of N, P_2O_5 and K_2O respectively.

[1970] (43)633.1-1.584
ARNOLD, E. **Der Menggetreidebau in Württemberg und Hohenzollern. [Mixed-grain cultivation in Württemberg and Hohenzollern.]** *Landw. Jahrb.* 93, 1943 (350-400). [G.e.f.i.sp.]

The estimated yield of mixed grain rose from 14,000 tons in 1939 to 23,000 in 1942. The cultivation of winter mixed grain has lessened, but that of summer has increased to meet the lack of grain and straw fodder for cattle, pigs and horses, mainly on the home farm. Varieties of the same grain are seldom grown together, the most usual summer mixture being barley and oats. Common autumn or winter-sown mixtures are rye with spelt or wheat or barley. Selection

of the varieties is of some importance; definite rules cannot be given and mixtures should be selected after trial on the individual farm. It is established that mixing produces higher yields and greater security; on marginal soils mixed grain will give a satisfactory yield where the component crops would often fail if grown alone. The fertilizing, weeding, etc., of mixed crops are in general the same as for single crops.

[1971] (43)633.71-1.81
KOENIG, P. [New experiences with fertilizing tobacco in Germany.] *Rev. Int. Tabacs* 23, 1948 (84-86). C.A. 42 (6034).

For the seedbeds, compost soil, preferably containing tobacco stems and other vegetable residues, serves as fertilizer, after sterilization in a steam boiler. Cu and As preparations are used to prevent diseases. In the field, the transplanted seedlings are fertilized with a mixture of manure and additional fertilizer containing per hectare 40 kg. of N, 200 kg. of K_2O and 50 kg. of P_2O_5 . The acid soils on which this tobacco was grown required 500 kg./ha. of anhydrous $CaCO_3$; additions of MgO gave no conclusive results.

[1972] (44)631.415.1
FRANC DE FERRIÈRE, P. J. J. Carte schématique des pH du sol de la France. [Schematic map of the pH of the soil of France.] *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (164-169). [F.]

The map is not given, but it is said that there is a close relationship between the pH map and a lithological map, and a less close relationship between rainfall and pH. This latter relationship is, in its turn, connected with topography.

[1973] (45)631.4
BOTTINI, O. I terreni della Campania. [The soils of Campania.] *Ann. Fac. Agrar. Portici* 11, 1939-1940 (105-121). [I.]

Mainly geological and textural accounts of the volcanic and other soils of the provinces of Naples, Benevento, Avellino and Salerno, with round figures for their contents of $CaCO_3$ and total P_2O_5 , Ca, Mg, K and Na. There is no map.—R.N.

[1974] (469)631.4
BRAMÃO, D. L. The soil map of Portugal. *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (198-205). [E.] [Est. Agron. Nac., Sacavem, Portugal]

Brief descriptions are given of the climatic, vegetation and soil types of Portugal. The soils include red soils, brown forest soils, chernozem-like soils, podzols, grey-brown podzolic soils and peat and moorland soils. A map is being prepared on a scale of 1:25,000. The soil species (roughly corresponding to the American soil type) is the mapping unit, with the soil variety (corresponding to the American soil phase) as the next highest category.

[1975] (485)634.9-1.4
TAMM, O. Influence exercée par la végétation forestière et les bruyères sur les sols de la partie méridionale de la Suède. [The influence of forest vegetation and heaths on the soils of the southern part of Sweden.] *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (206-209). [F.] [Experimentalfältet, Stockholm]

Most of south Sweden is covered by young, slightly weathered moraine deposits on which brown earths, more or less podzolized, have developed. Coniferous and birch forests occupy the stony soils; soils containing few stones are used for agriculture. Many of the present forest soils were formerly cleared and used to produce hay, except in the rainy western part where heather occupied cleared areas. The hay kept the soils in good condition, and they are now excellent forest soils. The heath soils have become podzolized, and it is possible to estimate the age of a heath by the degree of podzolization. Soils which have never been cleared tend to be fairly strongly podzolized, but produce quite good spruce forest.

There are also in south Sweden areas of sandy, siliceous moraines on which advanced podzolization has taken place. These soils are nearly always covered by pine forest.

[1976] (492)631.4
VOORT, M. VAN DER. Nieuwe stromingen in de bodemkunde speciaal in Nederland. Verlofsindrukken en literatuurstudie. [New developments in soil science with special reference to Holland. Impressions of a vacation trip and literature study.] *Landbouww* 19, 1947 (490-514). [Du.e.]

Recent developments in soil science are discussed under the headings: development as a productive science; social aspects; soil conservation; soil utilization; land classification; soil fertility; soil mapping,

including nomenclature and methods; chemical investigations by various methods; determination of P, K and pH; *Aspergillus*, Morgan and spectral-analysis methods.

[1977] (492)631.616
EDELMA, C. H. Les recherches pédologiques des terres inondées aux Pays-Bas. [Pedological researches of flooded soils in the Netherlands.] *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (115-118). [F.] [Wageningen]

About 10% of the agricultural land of Holland was flooded during the war. Great efforts are being made to reclaim it, especially with gypsum of which it is estimated that 500,000 tons are required. In planning reclamation treatment much use is made of detailed soil maps.

(5) ASIA

(See also Abs. No. 1951)

[1978] (51)631.3
YU, J. Y. T. Chinese agriculture and its mechanization. *Agric. Engng.* 29, 1948 (297-298, 300).

The median farm size is 3.31 acres, divided on the average into 11 fields. Man labour—the more important source of power—is commonly overworked at harvest, planting and irrigation and under-employed at other times. The days of man labour required per acre of cotton and wheat are 53 and 26 in China compared with 14 and 1.2 in the U.S. The possibilities of mechanization are discussed from the point of view of the creation of co-operative or collective farms, the distribution of stationary power on the farms, the development of rural industry and the essential features of a small tractor required for Chinese conditions.

[1979] (51)631.4
CHENG, K. L. Physical properties of some soils developed from Hsiashu loam of Nanking. *Soils Quart.* 6, 1947 (53-60). [Ch.e.]

[1980] (51)631.4
CHENG, P. Y. Soils of Hwaian and Kaoyiu regions in Northern Kiangsu. *Soils Quart.* 6, 1947 (117-124). [Ch.e.]

[1981] (51)631.4
CHU, S. M. Notes on the soils of Lushan. *Soils Quart.* 6, 1947 (61-66). [Ch.e.]

[1982] (51)631.4
CHU, S. M.; HE, C. H. Soils of the flooded area near Chungmou, Honan. *Soils Quart.* 6, 1947 (107-116). [Ch.e.]

[1983] (51)631.4
HE, C. H.; CHEN, M. M. Soils and their utilization in Fungyang-Wuho, Anhwei. *Soils Quart.* 6, 1947 (125-134). [Ch.e.]

[1984] (51)631.4
HSI, L. T. Soils of Spratly Islands, Kwangtung. *Soils Quart.* 6, 1947 (77-80). [Ch.]

[1985] (51)631.4
HUANG, H. K.; TSENG, C. S. Soils of Fungtai-Shoubsien area, Anhwei. *Soils Quart.* 6, 1947 (135-148). [Ch.]

[1986] (51)631.4
LIU, C. Notes on some chemical and physical properties of the brown soils in Kansu Province. *Soils Quart.* 6, 1947 (95-100). [Ch.e.]

[1987] (51)631.4
MA, Y. T. Soil geography of Bogdo-Ula, Sinkiang. *Soils Quart.* 6, 1947 (81-85). [Ch.e.]

[1988] (51)631.4
RU, C. Y.; HUA, M. Soils of Taichung District, Taiwan Province. *Taiwan Agric. Res. Inst. Tech. Bull.* 6, 1947, pp. 96.

[1989] (51)631.4 : 627.51
HSI, C. F.; CHENG, P. Y.; TSENG, C. S. Soil problems of the Yellow River flooded area. *Soils Quart.* 6, 1947 (29-37). [Ch.e.]

The causes of the flooding are seasonal rains and the heavy silt load carried from the loess plateau. The main problems of the flooded area can be solved by soil conservation of the upper drainage areas. The soils of the flooded area are (1) calcareous alluvial soils, (2) saline soils in poorly drained areas, (3) compact, heavy clay soils of low productivity and used for wheat, barley and beans, (4) wet, paddy soils, grey in colour and heavy in texture with rusty mottlings and (5) poor, bare sand dunes.

Recent silty-clay and clay-loam deposits occur in the open plain or on the river bank. Sandy deposits occur in Honan Province. Deposits may be from a few cm. to more than 3 m. thick. Bush planting helps to fix the sand dunes.

[1990] (51)631.459
CHU, S. M. **Soil erosion and its control in Kiangsi.** *Soils Quart.* 6, 1947 (87-94). [Ch.e.]

Kiangsi is a series of alluvial plains and rolling hills surrounded by mountains except to the north. Annual rainfall is 1400-1800 mm., which falls mainly from April to July. Laterites, lateritic and purple soils occur in the hills and basins, and brown and grey-brown earths in the mountains. Landslides occur in the loose, deep, deforested lateritic soils where slopes are steep. Gully erosion occurs in the granite mountains but rarely in the purple soils where the slopes are gentle. Sheet erosion is active in the gently sloping lateritic and purple soils.

[1991] (51)631.47
HSI, L. T.; CHENG, P. Y. **Suggestions on the utilization and amelioration of the soils in Kaifung Area, Honan.** *Soils Quart.* 6, 1947 (101-106). [Ch.]

[1992] (51)631.47
JEN, M. N. **Agricultural landscape of southwestern China: a study in land utilization.** *Econ. Geog.* 24, 1948 (157-169).

Increase of crop production in Szechuan, Kweichow and eastern Yunnan depends on the provision of more fertilizers and irrigation water and the improvement of seeds. The development of hydroelectric power in some districts has already brought into cultivation areas formerly compelled to lie fallow in winter.

Numerous diagrams and tables illustrate the degree and type of use of the land of the six main areas, in which paddy occupies from 12 to 70% and dry-field crops (wheat, rape seed, maize, beans, sweet potato, etc.) from 3 to 50%.

[1993] (51)631.47
JEN, M. N. **Progress of land utilization survey in south-west China.** *Sci. Tech. China* 1, 1948 (25). [Univ. Nanking]

Land-utilization surveys have been carried out in Szechwan, Kweichow and Yunnan and areas have been mapped on scales of 1:50,000, 1:25,000 and 1:10,000. Szechwan is a province of parallel ridges and valleys with prosperous agriculture in the valleys and forests or barren land on the hills. In Yunnan large intermontane basins are the agricultural areas. There has been little progress in the survey of Kweichow.

[1994] (51)631.854
LU, F. H. **The soils and guano phosphate of Paracel Islands, Kwangtung.** *Soils Quart.* 6, 1947 (67-76). [Ch.e.]

The soil is rendzina derived from guano, sand and coral. It is grey to dusty brown or black sandy loam 6-25 cm. deep overlying 8-16 cm. of almost black sandy loam or hardpan. The subsoil is white sand or debris of coral or shells. The guano phosphate and rock phosphate contain high P, chiefly in the form of tri-calcium phosphate.

[1995] (52)633.18-1.5
LEONARD, W. H. **Rice as a crop in Japan.** *J. Amer. Soc. Agron.* 40, 1948 (579-602).

Details are given of acreage, yields, varieties, ecological factors, seed preparation, nursery-seedbed treatments, preparation of paddy fields, fertilizer application, transplanting, field management, special methods including late sowing and direct seeding, cultural methods for upland rice, diseases and pests.

[1996] (54)631.459
GORRIE, R. M. **Countering desiccation in the Punjab.** *Geog. Rev.* 38, 1948 (30-40).

Surveys made in 1870 and 1945 have indicated that desert conditions have been advancing north-eastward out of Sind and Rajputana at a rate of half a mile a year. The main causes of this insidious and unspectacular wind erosion are failure to conserve moisture, lack of manure and overgrazing. In some places wind-blown sand is derived from torrent beds which are the result of water erosion. Progress in soil conservation has been greatest in regions which have retained appreciable areas of scrub jungle for the conservation of which forest officers are responsible.

[1997] (548.7)631.416.871.1
CEYLON DEPARTMENT OF AGRICULTURE. **[The manganese content of the soils of Ceylon.]** *Ceylon Dept. Agric. Rept.* 1946, Pt.IV.D. 1948 (13-14).

Uncultivated soils usually contain more Mn than cultivated soils and the Mn content is directly related to the texture. The solubility of Mn depends largely on the soil reaction and the oxidation/reduction equilibrium. Paddy soils in particular have a low content of Mn which is present mainly in acid-soluble form. Termite-mound earth is always richer in Mn than is the surrounding soil.

[1998] (548.7)631.434 : 631.459
Koch, D. E. V. **Soil structure in relation to soil erosion.** *Trop. Agricst.* 103, 1947 (230-233).

The physico-chemical processes governing the loss of soil and the principles underlying crumb formation are discussed in outline. Repeated applications of NaNO_3 cause structure to deteriorate, $(\text{NH}_4)_2\text{SO}_4$ has little effect on structure, while K fertilizers tend to promote it. Aggregation can be promoted and erosion limited (1) on light soils by the application of basic slag and liberal frequent dressings of bulky organics (preferably as leguminous green manure) and by cultivation in a wet condition by a compacting implement such as a mouldboard plough, and (2) on heavy soils by the discing-in of lime even where the soil is not strongly acid, the moderate application of organics or the retirement of the land to perennial grass for at least 2 years, and by beginning tillage with implements which cause least compaction, if possible after the soil has dried out and has become slightly remoistened. Saline soils need to be drained free of salts before any attempt to build up structure.

[1999] (548.7)631.459 : 627.51
Burns, R. V. **Soil erosion in Ceylon with particular reference to floods.** *Trop. Agricst.* 103, 1947 (240-245). [Irrig. Dept. Ceylon]

In hill areas, rainfall exceeding 30 inches in 24 hours has been recorded and wind velocities are probably higher than the 50-60 miles per hour recorded in Colombo. The energy in 4 inches of rain striking the soil or cover at 50 miles per hour over 1 hour would be roughly equal to that expended in ploughing the area twice, while the flow of water at the common velocity of 20 feet per second in a gully fed by 1 acre under such rainfall would produce $2\frac{3}{4}$ horse power. Experiments show conclusively that the rate of run-off and soil loss is much greater on land which has been cleared of grass and weeds. 5 large flood-protection schemes and the construction of 17 large detention reservoirs are under consideration. Practices required to lessen erosion and the siltation of channels and reservoirs include the closer planting of tea bushes, the abandonment of clean weeding for a practice of cutting the weeds and letting them lie in place, the

use of contour ridging and replacement of topsoil from the contour drains and the reduction of water velocity in gullies by the use of small dams.

[2000] (548.7)631.459 : 634.9
De Rosayro, R. A. **Forests and erosion—with special reference to Ceylon.** *Trop. Agricst.* 103, 1947 (246-252).

Erosion, floods and landslides are in Ceylon primarily due to the replacement of forest by permanent agricultural crops. This has occurred mainly in the hilly centre and south-west and above all in the clean-weeded tea areas. There is an immediate need for the demarcation by aerial survey of unprotected catchment areas of the main rivers subject to floods and for their protection. The reclamation of heavily eroded catchment areas may be most quickly obtained by allowing the crop under cultivation to grow wild, with consequent colonization by shrubs and trees. On the worst-eroded areas the introduction of a rapid soil-covering species may be needed, for example *Acacia decurrens* (from seed) in the wet montane zone with a rainfall of 100 inches and over. Co-operative reafforestation in the dry zone has successfully provided rapid re-establishment of a forest cover, and the extension of the practice is urged.

(6) AFRICA

(See also Abs. Nos. 1771, 1774, 1816, 1923, 1948)

[2001] (611)631.473
Yankovitch, L. Carte schématique de la répartition des types de sols en Tunisie. Notice explicative. [Schematic map of the distribution of soil types in Tunisia. Explanatory note.] *C. R. Conf. Pédol. Méditerran.* 1947, 1948 (342-346). [F.]
A soil map is included.

[2002] (64)631.4
Bryssine, G. Contribution à l'étude des sols de l'extrême sud marocain. [Contribution to the study of the soils of the extreme south of Morocco.] *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (347-354). [F.]
The soils have been formed in a desert climate, the principal soil-forming factors being the winds and the freshets of the wadis.

Subterranean water contributes to soil formation where the water table is near the surface. Most of the soils are saline, and soil types can be distinguished by the quantity and kind of salts contained in the soils.

[2003] (64)631.4
GRILLOT, G. Les étapes de la pédologie marocaine. [**The stages of Moroccan pedology.**] *C. R. Conf. Pédol. Méditerran.* 1947, 1948 (377-379). [F.]

Soil studies were carried on vigorously from 1936 to 1940, stopped almost completely during the war, but have revived on a considerable scale since 1945. The main studies have been of irrigable land of which 500,000 ha. have been surveyed.

[2004] (64)631.4
MIÈGE, E. Les études pédologiques au Maroc. [**Pedological studies in Morocco.**] *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (380-388). [F.]

The principal studies of Moroccan soils are briefly discussed.

[2005] (65)63
BARBUT; BERTHAULT. L'Algérie agricole. [**Agricultural Algeria.**] *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (285-316). [F.]

Seven agricultural regions are distinguished and their geographical characteristics are described. Most of the present-day agriculture, viticulture and citriculture are the result of French colonization. Wine grapes comprise the main production. In 1938, 398,000 ha. were under vines, but the area has fallen steadily since then, and in 1945 was 341,000 ha. Yields also have fallen from 22 million hectoliters in 1934 to 9 million in 1945. Cereals are the main agricultural crops, grown by both Europeans and natives. Other products are dates, olives, citrus and tobacco. Animal production is small. There are 6,400,000 sheep, 886,000 cattle and 200,000 horses, mostly owned by natives.

[2006] (663)631.4
AUBERT, G.; MAIGNIEN, R. Les sols du Sénégal, au nord de la Gambie britannique. [**The soils of Senegal, north of the Gambia.**] *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (358-370). [F.]

The region studied has a tropical climate with wet and dry seasons, semi-arid in the north, sub-humid in the south. Most of it

is covered with sand. Much of the vegetation is savanna. The main soil-forming factors have been physical and chemical rock weathering and leaching. There are some grey and saline soils that have been formed by an upward movement of the soil solution. Profiles are described of grey soils, slightly leached soils, chestnut-coloured and brown semi-arid soils, rendzina-like soils, leached soils, saline soils, and soils with complex profiles.

[2007] (667)631.4
CLAY, G. F.; MONSON, W. B. L.; MCKENNA, D., ET AL. **Note on soils in the Voltaian Basin with particular reference to their suitability for groundnut production.** *Rept. of W. Afric. Oilseeds Mission* 1948 (50-51).

The soils of the Voltaian Basin are derived from (1) coarse sandstones, (2) siltstones and silty clay shales, (3) finer sandstones, (4) soft clay shales, (5) conglomerates or (6) river alluvium. Groundnuts are grown in scattered areas on hill-slopes in (1) and (2) and on the deeper soils with pale, orange subsoils of (3). Except for some soils in group (1), all the soils have ironstone concretions and in many places masses of ironpan occur at shallow depths. Such soils may be suitable for groundnut cultivation with hoes, and long bush fallows, but only the hillslope soils of group (1) are satisfactory for large-scale mechanized cultivation. Under savannah forest these soils showed 2-3 inches of dark, grey-brown humic loamy sand underlain by 12 inches of paler sand which graded into red sandy clay or clayey sand. This last layer may be several feet deep or, on the hill crests and upper slopes, it may be almost absent. For 2-3 feet below this the soil is heavier and, in the soils of the upper slopes, is densely packed with spherical ironstone concretions. Below is the parent sandstone. The soils are neutral to slightly acid in the upper few inches, becoming increasingly acid with depth to pH 4.5 in the lower subsoil.

The sands, clayey sands and sandy clays, 3-8 feet deep, of the middle and lower slopes have been developed from hillwash by soil creep down the slopes. Concretions are probably absent from these soils, which grade in depth from dark humic loamy sand through a less humic layer a foot or more thick into pink sand or red clayey sand.

The grey and brown mottled soils of the valley bottoms are developed partly from hillwash and partly from alluvium. They are usually 6 feet deep, are free from concretions and have a seasonally fluctuating water table at varying depth.

[2008] (667)633.74-1.5
TAMMES, P. M. L. De bevolkingscultuur van cacao op de Goudkust (West-Afrika). [Native cultivation of cacao in the Gold Coast (West Africa).] *Landbouw* 19, 1947 (477-489). [Du.e.]

Native cacao cultivation in the Gold Coast is surveyed; history, economics, climate, soils, cultural practices, pests and diseases and yields are included.

[2009] (675)631.458
MEULENBERG, J.; LEENHEER, L. DE. L'Afrique centrale, terre qui se régénère. [Central Africa, a land which is being regenerated.] *C.R. Conf. Pédol. Méditerran.* 1947, 1948 (355). [F.]

A short abstract of a paper which is said to refute the common belief that the soils of central Africa are deteriorating.

[2010] (68.01)631.617
WELLINGTON, J. Let us irrigate the Kalahari. *Veld Trust News* 4, No. 12, 1948 (24-26). [Univ. Witwatersrand, Johannesburg]

A plea is made for using the waters of the Okovango River for irrigating the Kalahari. The river comes from the well watered uplands of Angola and flows through the Kalahari Sandveld near the Angola southern border, where it forms a delta of 90 x 120 miles. The marshes of the delta are 2-17 feet deep and are filled with papyrus. A low mud embankment 20 miles long would effectively divert the flood waters from the western half of the delta where 2,000,000 acres could be drained and irrigated. Excess water could be led from the Popa Falls into an irrigation canal. The delta soils are black humus underlain by sand and clay, and are free from lime concretions.

[2011] (68.01)631.854
VELD TRUST NEWS. Wild birds feed Union's soil. *Veld Trust News* 4, No. 12, 1948 (10-12).

An account is given of the life of and protection given to the guano-producing

birds, the penguin, gannet and cormorant, which live and breed on the Government Guano Islands off the coast of South Africa.

[2012] (68.01)633.2.03
MEREDITH, D. Towards a national pastoral policy. *S. Afric. J. Sci.* 40, 1943 (37-56). [African Explosives Ltd.]

It is generally recognized that South Africa is a pastoral country and agricultural policy should be based on the development of pastoral resources. Veld treatment, agro-economic and regional surveys, grazing control, conservation and improvement of soils and pastures and mechanization are discussed.

[2013] (68.01)635.964-1.81
HALL, T. D.; MEREDITH, D.; MURRAY, S. M. Turf research in South Africa. *S. Afric. Golf*, January 20th, 1946, pp. 4.

In experiments on a soil of pH 4.5-5.5 at the Turf Station, Frankenwald, no fertilizer, P alone, Ca alone and P + Ca gave poor turf. NP, NPK, NP + Ca and NPK + Ca gave healthy growth but NP was less effective than the rest. There was little difference between the plots receiving K and those receiving no K. 400 lb./acre of rock phosphate and super. mixed, applied annually, 400 lb./acre of $(\text{NH}_4)_2\text{SO}_4$ applied twice a year and 1000 lb./acre of agricultural lime every 5 years gave healthy grass which resisted most common diseases and pests and which crowded out weeds.

(7) NORTH AMERICA

[2014] (712)633.11-1.58
JOHNSON, C. W. Relative decline of wheat in the prairie provinces of Canada. *Econ. Geog.* 24, 1948 (209-216).

High-grade export wheat is produced mainly on the brown and dark-brown soils. Price instability, drought and wind erosion, pests and diseases have encouraged strip cropping, the extension of grazing land, the feeding of wheat to livestock and diversification. The Prairie Farming Rehabilitation Act has resulted in widespread regrassing of abandoned farms, use of summer fallow and construction of ponds. In rotations suggested for a permanent system of agriculture, the fields are in wheat only $\frac{1}{3}$ - $\frac{1}{2}$ of

the time instead of $\frac{2}{3}$ as formerly, and legumes and grasses such as crested wheat grass are included.

[2015]

(73)631.459

LOWDERMILK, W. C. **Progress report on soil and water conservation in the United States.** *C.R. Conf. Pédol. Méditerr.* 1947, 1948 (267-268).

Reference is made to the growth of soil-conservation districts—"one of the most remarkable movements in American agriculture". Recent research on the dynamics of raindrops has revealed an unsuspected cause of much soil erosion.

[2016]

(73)631.824

MEHRING, A. L. **Magnesium in fertilizers, soil amendments and manures.** *Soil Sci.* 66, 1948 (147-159). [Bur. Pl. Indust., Beltsville, Md.]

Details concerning trends in the consumption of Mg in U.S. agriculture.

[2017]

(74)631.4

SECON, W.; CARLETON, E. A.; LAMB, J. **Physical land conditions of the fruit-breeding farm at New York State experiment station, Geneva, New York.** *N.Y. St. Agric. Expt. Sta. Tech. Bull.* 279, 1947, pp. 29. B.A.BIII, 1948 (150).

Details are given of the acreage under cultivation and forest and of drainage, erosion and organic-C content.

[2018]

(74)633.491-1.5

TRANter, W. W. **Tillage in potato production.** *Agric. Engng.* 29, 1948 (293, 296).

The common successful practice in central and south Pennsylvania is discussed. In the autumn (or early spring if the winters are normally mild) before the potato crop a cover-crop residue of clover or ryegrass is heavy-disc'd into the upper soil layer. Ploughing 8-10 inches deep is maintained just ahead of planting, every effort being made to turn the plough slice on edge. A heavy discing follows. Seed is planted 3-4 inches below ground level and only very lightly covered. Spacing is 10-12 inches and row spacing 32-34 inches. 1200-1500 lb. of 5-10-10 or 4-12-8 is a common application and is precisely placed in 2 bands about 1 inch below and 2 inches aside from the seed.

A blind cultivation and several spring-tooth harrowings follow, 2- or 4-row cultivators being used after emergence. On harvesting, the vine and roots are scattered to disintegrate into the soil, causing little trouble if the winter-wheat seed is disc-drilled in. Clover or rye grass is the last crop in the rotation. Deep-tilling operations and deep-rooted crops are required to correct the packing effect near ploughing depth caused by the heavy equipment.

[2019]

(75)631.67

CARREKER, J. E.; LIDDELL, W. J. **Results of irrigation research in Georgia—Part II.** *Agric. Engng.* 29, 1948 (301-302, 304).

In 1946, with well distributed rainfall, the application of $\frac{1}{2}$ -1 inch of irrigation water became necessary on 10 occasions between May and November. Yield increases were 12% with early squash, about 58% with lima beans, cucumber and okra and 120% with green pepper. In 1947, with a fairly dry period from July to September, irrigation significantly increased the yield of pole beans, okra, tomatoes and maize (especially with the closer hill spacings—12 and 18 inches). Irrigated permanent pasture carried twice as much stock as unirrigated.

Rotary sprinklers on portable pipes produced a distribution varying from 1 $\frac{1}{2}$ -3 inches on an intended 2-inch application, the pattern being considerably influenced by the wind. The soil became wet to at least 6 inches within a fairly short period. In certain years the irrigation system might have only a minimum use, and barely pay for operating costs, but in other years yields will be greatly increased.

[2020]

(78)631.416.327

SMITH, F. M.; SCHRENK, W. G.; KING, H. H. **Survey of the boron content of Kansas-grown alfalfa.** *Trans. Kans. Acad. Sci.* 50, 1947 (342-348).

Samples of alfalfa, which is sensitive to B deficiency in soils, were taken at one-tenth bloom and analysed by a simplified spectrographic method to be published later. Most of Kansas was shown to have an adequate supply of B. The lowest B contents (19 p.p.m.) were found in alfalfa from south-east Kansas, and when the crop is fertilized in this area the B content drops to below 15 p.p.m., suggesting that the addition of B with other fertilizers should be investigated.

[2021] (79)631.415.3
RUTHERFORD, D. M. **Investigations relating to soil salt problems.** *Calif. Citrog.* 32, 1947 (477, 490). *Biol. Abs.* 22 (1455).
An account of the work of the U.S. Regional Salinity Laboratory, Riverside, California.

(9) OCEANIA

[2022] (941)631.445.73 : 631.48
SMITH, R. **A relationship between soils and topography in South Western Australia.** *J. Aust. Inst. Agric. Sci.* 14, 1948 (15-17). [Div. Soils, Counc. Sci. Indust. Res.]

A detailed study of the distribution of laterite in an area in the vicinity of a granite boss acting as a local drainage divide indicated that most soil profiles described as lateritic resulted from the re-sorting of the original Tertiary profile in which the laterite was formed and that the mechanism of "soil creep" has been an important factor in this re-sorting of the unconsolidated soil materials on the slopes of the granite boss. General observations over a wide area of the Western Australian wheat belt confirmed these conclusions. The word "laterite" is used to describe formations composed largely of ironstone gravels, boulders or hardpan.

[2023] (943)631.4 : 551.5 : 581.5
FARMER, J. N.; EVERIST, S. L.; MOULE, G. R. **Studies in the environment of Queensland. I. The climatology of semi-arid pastoral areas.** *Queensland J. Agric. Sci.* 4, 1947 (21-59).

The seasonal incidence of effective rainfall is calculated for bi-monthly periods and Queensland is zoned on the basis of rainfall reliability. A close correlation between detailed soil type and climate is not obvious in this area. Specific soil types appear to be determined largely by parent rock and subsoil drainage. The general pattern of vegetation depends primarily on soil differences, though climate influences the composition of the major plant formations.

[2024] (943)634-1.874
ROSS, A. A. **The growing of green manure crops in the orchards of the Stanthorpe district [Queensland].** *Queensland Agric. J.* 65, 1947 (389-395). *Hort. Abs.* 18 (92, 93).

In this district a regular supply of organic matter is needed for the production of reasonable crops, green-manuring, preferably with legumes, providing the only practicable means. In the absence of irrigation, winter-growing species must be used. Species which tolerate the local extreme winter conditions include golden tares, field peas, tick or horse beans, vetches, clovers, wheat, barley, oats, New Zealand blue lupin and black winter rye, best results being obtained with the last two, which should be sown in manured land in January or early February and are usually turned in during August, being mixed with the top 3 inches of soil. Inoculation may be needed before sowing lupins.

[2025] (945)631.473
SKENE, J. K. M.; WALBRAN, W. I. **Soil survey of part of parishes of Tinamba, Winnindoo, Denison, Wooundellah, County of Tanjil, Victoria.** *Dept. Agric. Vict. Tech. Bull.* 7, 1948, pp. 70.

[2026] (95)634.61-1.584
BURCHAM, L. T. **Livestock grazing in the Russell Islands.** *J. Forestry* 45, 1947 (113-117). [Div. Forestry, Fresno, Calif.]

Lying 9°S. of the equator, the Russell Islands have a well-distributed annual rainfall of 150 inches and an average temperature of 80-82°F. The coastal soils are shallow, recently weathered clays and clay loams mixed with some loose coral and appreciable amounts of organic matter. Several thousand acres are cleared and planted to coconuts with cover crops of *Axonopus compressus* and *Rhaphis aciculata* which produce abundant high-quality forage. There is no evidence of overgrazing, accelerated erosion or other deterioration.

[2027] (961)63
BADCOCK, W. J. **Agriculture in the British Solomon Islands Protectorate.** *Fiji Agric. J.* 17, 1946 (63-79). *Biol. Abs.* 22 (1291).

Describes geology, soil, climate, crops, etc.

COMMONWEALTH BUREAU OF SOIL SCIENCE

PAMPHLETS AND REPRINTS OBTAINABLE
ON LOAN

List No. 48.

September, 1948.

MISCELLANEOUS

5970. 55.04. NOCKOLDS, S. R.; MITCHELL, R. L. The geochemistry of some Caledonian plutonic rocks: a study in the relationship between the major and trace elements of igneous rocks and their minerals. *Trans. Roy. Soc. Edinburgh*, 61, Part 2, 1948 (533-575).

5945. 55I.48I : 54I.134.5. MORTIMER, C. H. The exchange of dissolved substances between mud and water in lakes. *J. Ecol.* 29, 1941 (280-329); 30, 1942 (147-201).

63I.4 SOILS

6024. 63I.4. KELLOGG, C. E. Conflicting doctrines about soils. *Sci. Month.* 66, 1948 (475-487).

63I.4I SOIL CHEMISTRY

604I. 63I.4II.4 : 553.97. FRASER, G. K. British peats. *Agriculture* 55, 1948 (71-78).

5977. 63I.4I4.04. PETERSON, J. B. Water stability of bentonite films. *Proc. Soil Sci. Soc. Amer.* 1946, 11, 1947 (53-56).

60II. 63I.4I4.324 : 63I.8II. ITALLIE, T. B. VAN. Cation equilibria in plants in relation to the soil: II. *Soil Sci.* 65, 1948 (393-416).

6017. 63I.4I5.I : 63I.4I4.3. LITYNSKI, T.; ZIMNY, F. Research on the determination of the "hydrolytic acidity" of the soil. *C.R.M. Acad. Polon. Sci. Let. (Cl. Sci. Math.)* No. 1-3, 1947 (10-11). [E.]

597I. 63I.4I5.36. UNITED STATES REGIONAL SALINITY LABORATORY. Diagnosis and improvement of saline and alkali soils. *U.S.D.A. Bur. Pl. Indust.* 1947, pp. 157.

6016. 63I.4I5.36. GREENE, H. Using salty lands. *FAO Agric. Studies* 3, 1948, pp. 49.

5978. 63I.4I5.36 : 546.22. POWERS, W. L. Reclamation and use of alkali soils. *Oreg. Agric. Expt. Sta. Bull.* 10, 1946, pp. 31.

6035. 63I.4I6. SPIRHAZL, J. Půda jako heterogenní soustava. [Soil as a heterogeneous system.] *Vest. Čsl. Akad. Zeměd.* 21, 1947, No. 10, pp. 6. [Cz.f.]

5948. 63I.4I6 : 63I.8I. PAAUW, F. VAN DER. [Investigations on phosphate and potash manuring of the marine-clay soils of the isles in the Province of South-Holland.] *Versl. Landbouwk. Onderzoek.* 53, 5A, 1947 (213-246). [D.u.e.]

6003. 63I.4I6.I : 63I.4I7.2 : 63I.58 MILLER, M. F. Studies in soil nitrogen and organic matter maintenance. *Missouri Agric. Expt. Sta. Res. Bull.* 409, 1947, pp. 32.

5993. 63I.4I6.2 : 63I.4I4.3. BURD, J. S. Chemistry of the phosphate ion in soil systems. *Soil Sci.* 65, 1948 (227-247).

5958. 63I.4I6.2 : 63I.4I4.3 : 539.I6. NELLER, J. R.; COMAR, C. L. Factors affecting fixation of phosphorus in soils as determined with radioactive phosphorus. *Soil Sci.* 64, 1947 (379-387).

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